THE
THEORY
OF
Jupiter's Satellites,
WITH THE
Conſtruction and Uſe
OF THE
TABLES
For Computing their ECLIPSES.

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LONDON:
Printed for the AUTHOR, and ſold by W. and J. MOUNT
and T. PAGE, on *Tower-Hill*. 1749.

[Price Five Shillings.]

To the Right Worshipful

Sir *JOHN BARNARD*, Knt.

A L D E R M A N,

One of the

REPRESENTATIVES in PARLIAMENT

FOR THE

C I T Y of *L O N D O N*,

AND

PRESIDENT of CHRIST'S-HOSPITAL,

THIS Treatise upon the *Theory of Jupiter's Satellites*, designed in Part for the Use of the Children of the Royal Mathematical SCHOOL, as a grateful Acknow-

knowledgement of many Favours received, is most humbly Dedicated, by his

Most obedient, and

Most devoted Servant,

JAMES HODGSON.

THE

INTRODUCTION.

AT the Requeſt of my worthy kind Friend and Relation, the late Reverend Mr *John Flamſteed*, His Majeſty's Aſtronomer-Royal, I undertook the Correction of his Tables of the Motions of *Jupiter*'s Satellites; and I the more readily engaged in the Work, when I conſidered the Benefit that would accrue to the Children in the Royal Mathematical School committed to my Care. For as the Intent and Deſign of the Royal Founder was to breed up a Set of ſkillful able Men, capable not only to conduct a Ship from any one Part of the Navigable World to another, but to make ſuch Obſervations from Time to Time, as might contribute to render thoſe uſeful Branches of Science, Geography and Hydrography, more perfect; and to this End I thought, that by inſtructing them how to compute the Eclipſes of *Jupiter*'s Satellites, which may be done with very little Trouble, and at the ſame Time to ſhew them how to obſerve them, might not contribute a little to the Purpoſe.

The principal Uſe that *Galileus* himſelf, and his Cotemporaries, propoſed to make of theſe little Secondary Planets, after their firſt Diſcovery, was to find the Difference of Longitude between Places howſoever remote; and among the great Variety of Phænomena that ariſe from their mutual Intercourſe one with another, the Obſervations of their Ingreſs into, and their Egreſs out of, the Shadow of *Jupiter*, has been judged the moſt proper for the Purpoſe, and this Thought has been carried to ſo great a Pitch, that I may venture to ſay, that there are very few Places of Note upon the Surface of this our habitable Globe, whoſe Longitude are known, that have not either been abſolutely determined by them, or at leaſt have been rectified and confirmed by them. The great Number of Eclipſes that happen every Year, there being at leaſt as many as there are Days in it, and which

are viſible in one Place or another, when *Jupiter* is to be ſeen, which is near eleven Months in the Year, there is ſcarce a Night but one or more of theſe Eclipſes will happen; and conſidering the great Eaſe which they may be obſerved, eſpecially ſince the great Improvement made in the Reflectors, and the little Skill required in the Obſervor, it is to be hoped, that we ſhall in Time, have a ſufficient Number of Obſervations, to give us a new and true Deſcription of this our Terreſtrial Globe.

The Sun, according to the modern Hypotheſis, is always in the Plain of *Jupiter*'s Orb, as he is always in the Plain of the Elliptick, and the Ray which goes from the Center of the Sun, extends itſelf over the Plain of his Orb, as the Ray which goes from the Center of the Sun to the Center of the Earth, extends itſelf over the Plain of the Ecliptick. The Globe of *Jupiter*, which is opaque as the Globe of the Earth, ſtops the Progreſs of the Sun's Rays, and makes on it's oppoſite Side, a Shadow which lies in the ſame Plain with his Orb, as the Earth interrupts the Rays of the Sun, and makes a Shadow, whoſe Axis lies in the Plain of the Ecliptick, and when the Satellites of *Jupiter*, which are alſo opaque, as the Moon is, in their Revolutions about him, fall into his Shadow, they are eclipſed, being deprived of the Light they receive from the Sun, as the Moon is eclipſed when ſhe falls into the Shadow of the Earth by the Loſs of the Solar Rays, in like Manner, when the Satellites paſs before *Jupiter* ſo near his Orb, that they fall into the Rays of Light, which are going to *Jupiter*, they make then a Kind of an Eclipſe of the Sun, making a Shadow upon the Globe of *Jupiter*, in the ſame Manner as the Moon does when ſhe paſſes before the Sun ſo near the Ecliptick, that ſhe interrupts the Solar Rays which are going towards the Earth, and makes an ordinary Eclipſe of the Sun; and for this Reaſon the Orbit of *Jupiter* may be called the Ecliptick of *Jupiter*, and of his Satellites, as the Line of the annual Motion, either of the Sun or of the Earth, is the Ecliptick of the Sun or Moon, although they are uſually called the Ecliptick ſimply, becauſe the Eclipſes of the Sun and Moon are always made in this Line. Now as in the Syſtem of the Moon, the Variety of Eclipſes depends principally upon the Situation of the Orbit of the Moon, with regard to the Ecliptick; if this Orbit lay in the Plain of the Ecliptick, upon which the Ray that goes from the Center of the Sun to the Center of the Earth, and the Axis of the

the Earth's Shadow lay in the ſame, then in all the Conjunctions of the Moon with the Sun, there will happen a Central Eclipſe of the Sun in that Place of the Earth where the Sun ſhall happen to be in the Zenith, and in all the Oppoſitions of the Moon and Sun, there will happen a Central Eclipſe of the Moon; in like Manner, if the Orbits of the Satellites of *Jupiter* lay in the ſame Plain with the Orbit of *Jupiter*, all the Satellites in their Conjunctions with the Sun ſeen from *Jupiter*, will undergo Central Eclipſes, and in all the Oppoſitions, all the Satellites will ſuffer Central Eclipſes alſo.

But becauſe the Orbit of the Moon is inclined to the Ecliptick, and cuts it in two oppoſite Points, which are the Nodes of the Moon, the Central Eclipſes can never happen; but when the Sun ſeen from the Earth, and the Earth ſeen from the Sun, the viſual Rays meet in the Nodes of the Moon, which cannot be applied to the Satellites of *Jupiter*, in caſe their Orbits were inclined to the Orbit of *Jupiter*.

The Eclipſes of the Satellites of *Jupiter* are not central in this Caſe, but when the Sun ſeen from *Jupiter*, or *Jupiter* ſeen from the Sun, the viſual Rays meet in the Nodes of the Satellites, and as in the Conjunction of the Moon with the Sun, which happens at ſome Diſtance from the Nodes of the Moon, we are obliged to conſider this Diſtance, which being joined to the Inclination of the Orbit of the Moon, determines her Latitude, which muſt be compared with the Space, that the Moon, the Earth, and her Shadow, occupy in the Orb of the Moon, to determine if there will be an Eclipſe or not, and if there be any, how long the Duration will be. We are obliged to make the ſame Enquiry in the Conjunctions of the Satellites of *Jupiter*, ſeen from the Sun for to determine their Eclipſes, if their Orbits are inclined to the Orb of *Jupiter*, for which Reaſon it is neceſſary to find where the Nodes cut it. The Eclipſes of *Jupiter's* Satellites cannot be ſeen from the Earth, neither near the Conjunctions of *Jupiter* with the Sun, when it is hidden in the Solar Rays, nor near the Oppoſitions, when the Shadow of *Jupiter* terminates in the Orbs of the Satellites, which is not expoſed to the Earth, nor hid in the Globe of *Jupiter*, which is between the Earth and the Shadow. We cannot obſerve the Eclipſes when *Jupiter* is remote from the Oppoſitions and Conjunctions with the Sun, when at the Times the Earth is Side-ways of the Line, which goes from the Sun to *Jupiter* and his Shadow,

for

for then the Shadow appears on the Side of *Jupiter*, and you lose the Sight of the Satellites, when they meet with it.

The Distance of the Center of the Shadow of *Jupiter* from the Nodes of the Satellites, compared with their Inclination, and to the Diameter of the Shadow, determines the Eclipses, which obliges us to determine the Place of their Nodes to all the Exactness possible. It is difficult always to determine the Places of the Nodes of the Planets. If they left a visible Trace behind them, the Places of the Nodes, and where they cut the Orbs, would be visible also, and one might determine them in the same Manner as you do the Places of the Planets; but as they leave no visible Traces, we must find the Nodes by more difficult Methods; we find the Places of the Nodes of the Moon, either by Observations of Central Eclipses, which are very rare, or by comparing a great Number of partial Eclipses, and those of the Planets, in observing at divers Times and in divers Places, removed from each other the same Planet, to determine them with regard to the Fixed Stars.

The Places of the Nodes of the Satellites of *Jupiter* in his Orbit, are much more difficult to determine than those of the Moon and *Jupiter*, their central Eclipses which return but every six Years for our Observations; and the State of the Air not always permitting us to observe them when they happen, and to distinguish them easily, as you may those of the Moon, which may serve for this Use, although you cannot immediately see in the Middle of the Eclipse, if the Center of the Moon concurs with the Center of the Shadow, which is not visible; nevertheless, when it is emerged about one-half, you must observe with Attention, the Part of the Circumference, which falls in the Disk of the Moon, which is often more than one-ninth Part of the whole Circumference of the Shadow; and to trace it in the Disk of the Moon, observing by what Spots distant from each other it passes; and if you find that at it's Entry, as well as at going out, it passes by the same Spots, you may conclude the Eclipse has been central, but if at his going out, the Line drawn through the Center of the Moon's Shadow passes by different Spots from those it passed by at it's Entry, you may conclude the Eclipse has not been central, and one must endeavour to find the Center of the Shadow by the Part of the Circumference, which falls upon the Disk of the Moon at it's Entry, and

and at it's going off, and measure how much the Center of the Moon is removed from it.

But in the Eclipses of *Jupiter's* Satellites, you cannot distinguish by the best Glasses hitherto made use of, the circular Boundary of the Shadow in their Disk, it appears that the Satellite diminishes by little and little, without changing it's Figure, the Points crossing each other not being sensible at so great a Distance, or at least the Satellite diminishes, and it's Light grows weaker and weaker, till at last it entirely disappears, which happens, no doubt, before it's total Immersion into the Shadow; when the Part that remains illuminated is not visible by our best Telescopes, whence it comes to pass, that by smaller Telescopes, and less excellent, you lose the Sight of the Satellite sooner, although it be known by Experience, that a small Difference in the Lengths of the Telescopes, does not make any considerable Difference in the Time of the Immersion.

Again, At it's going out of the Shadow, the Satellite begins to appear like a Point, which increases little by little, both in Magnitude and Light, without changing it's Figure, till at last it shines in it's greatest Lusture.

But it is not impossible, but that the different Phases of the Satellites may be seen, when you have carried Telescopes to a greater Perfection: Now because you cannot make use of that Part of the Circumference, which falls upon the Disk of the Satellite, to determine exactly the Center of the Shadow of *Jupiter*, the Diameter of which is twenty Times greater than the Diameter of the Satellite, whereas the Diameter of the Shadow of the Earth is not three Times greater than the Diameter of the Moon. It remains then, that we compare together a great Number of Eclipses of the same Satellite of *Jupiter*.

Particularly those of which we have observed the Beginning and End, to chuse such as are of the longest Duration, that may be supposed to be almost central, or at least such as we have found considerable Inequalities in their Motions, which may hinder the central Eclipses, which are not always those of the longest Duration.

We cannot see the Beginning and End of all the Eclipses of the Satellites of *Jupiter*, we can sometimes observe the two Phases in the Eclipses of the third Satellite, and those of the fourth Satellite; and particularly when they are near the Quadrature of *Jupiter* with the Sun, when the Earth is far removed from the right Line, that

goes from *Jupiter* to the Sun, for to discover in the Orbs of these two Satellites, which are the most distant from *Jupiter*, the Place opposite to the Sun, or the Bound of the Shadow of *Jupiter*, from which it will appear to us how much more distant from *Jupiter*, when he is nearer to the Quadrature.

It is not the same with regard to the first and second Satellite, because they are so near to *Jupiter*, that when they are in their Quadrature with the Sun, *Jupiter* hides one Part of his Shadow from us, terminated in the Orbs of the two Satellites, wherefore in their Central Eclipses, we cannot see their Entry into the Shadow of *Jupiter*, before the Opposition of *Jupiter* with the Sun, nor their going out of it, after the Opposition of *Jupiter*, and not one or other Phase of the same Eclipse.

In the Eclipses which are not central, the second Satellite passes sometimes so far from the Center of the Shadow, in the Part which is not by *Jupiter*, that we cannot see but rarely, not only when it enters, but when it comes out, which never happens to the first Satellite, because the greatest Part of the Line of it's Incidence into the Shadow, is not always hid in the Disk of *Jupiter*, therefore we can never observe in the same Eclipse, it's Entrance into the Shadow, nor it's going out, and consequently we cannot immediately observe the Duration of these Eclipses in the Shadow.

As to the Latitudes of the Satellites, it is confirmed by comparing a great Number of Observations, during many Revolutions of *Jupiter*, that the Nodes of the Satellites lay always in or near the same Place, for since in the Nodes of *Jupiter*, determined by divers Astronomers, there is a very considerable Difference; and as to the Cause, we know not how to attribute it, unless to the Observations that have been made use of to find it, or to the Method that has been employed in it, there is no Room to be astonished, if in the Nodes of the Satellites, which are much more difficult to determine, than those of *Jupiter*, so that we ought not to make slight of almost all the Difference which is found amongst all the Observators, but it is necessary to examine the Methods made use of by divers Observators, to resolve a Doubt of so great Consequence, and to examine the Manner which several Observators have made use of to find the Latitudes of the Satellites, which serve to find out the Places of their Nodes.

It

It is to be remarked, that all the Obſervators have not always made the Diſtinction they ought to have done between the Latitude ſeen from the Earth, which regulate the apparent Conjunctions of the Satellites, and the Latitudes ſeen from the Sun, which regulate their Eclipſes in the Shadow, and that they have not known the Dependance theſe two Kinds of Latitudes have to a third, which is that of the Latitude of the Satellite ſeen from *Jupiter*.

The Latitudes ſeen from the Earth were the firſt that were known by Obſervations, from whence was got the Knowledge of the Latitudes ſeen from the Sun, and to know the Latitudes of the Satellites ſeen from *Jupiter*, you muſt ſuppoſe the Knowledge of the Latitudes of the Satellites ſeen from the Earth, the Theory of the Sun and of *Jupiter*, and in Part, that of the Satellites, and this Method muſt be obſerved to arrive at a Knowledge of the true Situation of the Orbs of the Satellites, with regard to the Orb of *Jupiter*, and of the Ecliptick, which Situation determines itſelf by the Nodes of the Orbs of the Satellites, with the Plain of the Orbs, and by their Inclinations, which are the two Elements of the Theory of their Latitudes.

The Theory of the Satellites being eſtabliſhed, we muſt make uſe of a contrary Method to determine the Eclipſes of the Satellites of *Jupiter*, and their apparent Conjunctions, the Diſtance of the Satellites and their Nodes, ſeen from *Jupiter*, and the Inclinations of their Orbs, ſerve to find their Latitude ſeen from *Jupiter*; theſe Latitudes, and the Theories of *Jupiter* and the Sun, ſerve to find the Latitudes of the Satellites ſeen from the Sun; and at laſt the Latitudes ſeen from the Sun joined to theſe Theories, ſerve to find the Latitudes ſeen from the Earth.

It muſt be obſerved, that in the Satellite Obſervations, the Latitudes of the ſame Kind have not taken their Commencement from the ſame Term, no Body has taken the common Ecliptick for the Boundary of the Latitudes of the Satellites, from whence the Latitudes of the Planets and fixed Stars, take their Beginning, which is not without Reaſon for the Latitudes of the Satellites taken from the Ecliptick, do not immediately regulate neither their Conjunctions nor their Eclipſes, and cannot be obſerved immediately by the Teleſcope, it is more proper to take for the Boundary of the Latitudes of the Satellites, from a Line which paſſes through the Center of *Jupiter*, according to the Direction of their proper Motions, to the

the End that in their Conjunctions the Latitude may ſerve to find immediately, if the Eclipſes or Conjunctions are central, and how far they are diſtant from the Center, if they are not central, which will alſo ſerve to determine their Duration, and the Times of their Beginning and End.

As the Orbit of *Jupiter* is deſcribed by the periodical Motion of it's Center, there are ſome who have taken this Orbit for the Boundary of the Latitudes of the Satellites, which would ſerve very commodiouſly if the Orbits of the Satellites were placed upon the Orb of *Jupiter*, in which Caſe you would have the apparent Latitude with regard to the Earth, becauſe of the Elevation of our Eye above the Plain of this Orbit, but there are others who have taken the Bounds of the Latitudes of the Satellites, from the Line which paſſes through the Points of their greateſt Digreſſions.

In the central Conjunctions of the Satellites of *Jupiter*, ſeen from the Earth, the viſual Ray which goes from the Center of *Jupiter* along the Plain of their Orbs, and which is ſuppoſed to paſs through the Center of *Jupiter*; alſo as the Plain of the Orbit of the Moon paſſes through the Center of the Earth, at which Time the Orbs are repreſented as a ſtrait Line, paſſing through the Center of *Jupiter*, upon which the Satellites have no proper Latitude in their Revolutions, for here no Notice is taken of the common Latitude, which is the Diſtance of the Planet from the Ecliptick, but of the proper Latitude of the Satellite of *Jupiter*, which is taken from the Line which paſſes through the Center, alſo of *Jupiter*, extended according to the Longitude of the apparent Motion, that the Satellites make on one Side or the other of *Jupiter*, whether this Line be parallel, or inclined, as *Galileus* ſuppoſed at firſt, or whether it be extended according to the Orb of *Jupiter*, as the others have been ſuppoſed to be, or whether it is inclined to the Ecliptick, or to the Orb of *Jupiter*, in any Manner whatſoever, but in the apparent Conjunction of the Satellites of *Jupiter*, which are not central, the viſual Ray which goes from the Center of *Jupiter*, is a little elevated above the Plains of the Orbs of the Satellites, for which Reaſon theſe Orbs are repreſented to our Eye as Ellipſes, of which the leaſt Diameter is the Line which repreſents the Diameter of the Circle, the moſt oblique to the viſual Ray, in the Syſtem of the Satellite, theſe circular Orbs being ſuppoſed concentrick to *Jupiter*, till we can diſcover ſome evident Excentricity, having

having now taken, in the ſame Circle, the Diameter, which is perpendicular to the viſual Ray, the Extremities of which, are equally diſtant from the Earth, it will not divide exactly into two equal Parts, the apparent Eclipſes which repreſents the ſame Circle, becauſe the upper Part being removed farther from the Earth than the lower, it will appear a little leſs, whence the Center of *Jupiter* is removed a little farther from the Center of the Ellipſis, towards the ſuperior Part; and the greateſt Diameter of the Ellipſis falls in the lower Part of the Circle; and the Points of the greateſt Digreſſion of the Satellite are in the extream Parts of the greateſt Diameter of the Ellipſis.

Theſe two oppoſite Points of Digreſſion, which divide the apparent Ellipſe into two unequal Parts, do not divide exactly the Orbit of the Satellite into two equal Parts, there being a little Difference; but the Difference in the Fourth Satellite, where it is the greateſt, does not amount to 25 or 26 Minutes of the Circumference of a great Circle, deſcribed in the Orbit of the Satellite, for this Reaſon it is commonly neglected, and we take ordinarily for the Line of Longitude of the Satellite, the greateſt Diameter of the Ellipſis, in the Room of the perpendicular Diameter to our viſual Ray, in the Circle repreſented by this Ellipſis.

The Synodical Latitudes of the Satellites are taken upon the leaſt Diameter of the Ellipſis on one Side, and the other of the Center of *Jupiter*, and they are the greateſt Latitudes which happen in one and the ſame Revolution of the Satellite, and the other Latitudes are taken on one Side or the other of the Line of Longitude, upon the perpendicular Lines theſe Latitudes diminiſh continually, according to the Diſtance of the Satellite from *Jupiter*; and thoſe which are in the lower Part, very near to the Earth, are a little greater than thoſe which are at a like Diſtance from *Jupiter*, in the upper Part, more removed from the Earth, but the Difference is ſo little, that it is commonly neglected, and that without any ſenſible Error.

As the Latitudes of the Satellites ſeen from the Earth ſerve to determine their apparent Conjunctions, the Latitudes of the ſame Satellites ſeen from the Sun, ſerve to determine their Eclipſes in the Shadow of *Jupiter*; and the Eclipſes of *Jupiter*, made by the Shadow of the Satellites, when the Plains of theſe Circles upon which the Satellites make their particular Movements, are directed to the

Center of the Sun, theſe Circles are viewed from the Sun as a right Line, which paſſes through the Center of *Jupiter*, and then the Satellites have no apparent Latitude, with regard to the Sun, and the Eclipſes are central; and thoſe which are made at *Jupiter* by their Shadows, are alſo central; but when the Plains of the Circles of the Satellites are not directed to the Sun, they are repreſented to the Sun as Eclipſes, more or leſs expanded, according to the different Elevations of the Eye, above the Plains of theſe Circles, and then the very leaſt Diameter of the Ellipſes repreſents the Diameter of the Orb of the Satellite, which is the moſt oblique to the Ray which goes from the Center of the Sun to the Center of *Jupiter*, and to the Orbit of the Satellites.

It is upon the leaſt Diameter of the Ellipſes, that you take the Synodick Latitudes ſeen from the Sun, but the Diameter perpendicular to the ſame Ray of the Sun, which divides the Circles into two equal Parts, the one ſuperior and the other inferior, is repreſented by a right Line, parallel to the great Diameter of the Ellipſis, ſo that as we have ſaid, the Latitudes of the Satellites ſeen from the Earth are not applicable to the Latitudes of the ſame Satellites ſeen from the Sun, if it was not that their Variation ſeems to be more ſimple, and to have but one Period of twelve Years, which anſwers to that of *Jupiter* about the Sun, not having any annual Variation, which is ſeen from the Earth; it appears alſo that the Line which terminates the proper Latitudes of the Satellites ſeen from the Earth, but that one declines from the other diverſly, becauſe that the Ray of the Sun which goes from *Jupiter*, declines from the viſual Line which goes alſo to *Jupiter*; 'tis for this Reaſon we have ſeen ſometimes the Shadow of a Satellite enter into, and go out of, the Diſk of *Jupiter*, in two Points a little different from thoſe by which we have ſeen the Satellite enter and go out in the ſame Revolution, which has obliged ſome to find a Method to determine one of theſe Appearances by the Means of the other.

Thoſe who firſt obſerved the Satellites of *Jupiter*, had much Trouble to determine their proper Latitudes ſeen from the Earth, becauſe they had no other viſible Mark to determine this Line, which terminates the Latitudes, than the apparent Center of *Jupiter*, through which this Line paſſes, they uſually took for to bound this Line, the two Points of the greateſt Digreſſion of the Satellites with regard to *Jupiter*, which are not viſible, but when the Satellites

lites are in them, we cannot know when they are in them, otherwise then by Hypothesis, which are not as yet sufficiently established, so that it is difficult to determine if this Line is extended along the Orbit of *Jupiter*, or if it is parallel to the Ecliptick, or if it declines on the one or the other, and how much.

The Observation of one Satellite, made at it's greater Digression from *Jupiter*, cannot be made use of as a Rule to find the Latitudes of the same Satellite at other Times, because there remains no visible Tract after the Satellite is removed from it, but comparing this Line of the Satellite's Motion with the fixed Stars, which it meets with but seldom, in the same Aperture of the Telescope, but because the proper Motion of *Jupiter* changes the Situation of the Orbs, with regard to the fixed Stars, almost as sensibly as the Satellite change, with regard to the apparent Center of *Jupiter*; we cannot infer from this Comparison, the same Use for to determine the Latitudes of the Satellites, as you may to determine the Latitude of the Moon.

It appears by a very great Number of Observations compared together, in order to fix the Latitude of each Satellite, that the greatest Latitude of the first Satellite seen from the Earth, does not exceed one-third Part of the Semidiameter of *Jupiter*. That the greatest Latitude of the Second Satellite exceeds but a little one-fourth Part of his Diameter. That the greatest Latitude of the Third Satellite exceeds but a little above three-fourths of his Diameter; and that the greatest Latitude of the Fourth Satellite is greater than the Semidiameter of *Jupiter*, by one-third Part of the same Diameter.

As the principal View of King *CHARLES* II, the Founder of the Royal Observatory, was to obtain a good Catalogue of the fixed Stars, in order to render their Appulses to the Moon, or their Occultations, by the Interposition of her Body, useful in determining the Longitudes of Places, of which I have given some Instances in the Course of this Book, so Mr *Flamsteed* has given us the Places of near 1000 fixed Stars, which lie within the Zodiac, each of which will be covered by the Moon, or the rest of the Planets, in one Revolution of her Node, so that it is scarce possible one Night can happen, but some or other of them will be eclipsed, or approached so near, as to come within the Compass of a Telescope, in one Place or another; now if to these we add the Eclipses of *Jupiter*'s Satellites, it is scarce possible that any clear Night can happen, but the

the Heavens afford us ſome agreeable *Phænomenon*, by which the Longitude of any Place may be duly aſcertained.

The chief Objection againſt the Uſe of Pendulum Clocks and Watches, recommended by Monſieur *Hugens*, is the Effect that Heat and Cold have upon the Spring and Pendulum, which makes the Spring in Watches draw ſtronger at ſome Times than at another, and cauſes the Pendulum to lengthen and ſhorten, according as the Weather is hotter or colder, but theſe Effects are ſo regular, that without doubt they may be accounted for; but the principal Thing that ſeems wanting to render the Methods propoſed practicable, is a true Knowledge of the Hour of the Day or Night, this may be readily obtained from the true Altitude of the Sun by Day, or of a Star in the Night, for their Declinations at all Times, are given; and as a ſmall Error in the Latitude will make no conſiderable Error in the Time, it being one of the containing Sides of the Horary Angle, if the Altitude of the Sun or Star be taken to one or two Minutes, the Hour of the Day or Night may be found to all ſufficient Degrees of Exactneſs, this may be done on Land, with a common Quadrant of 18 Inches Radius, rightly adjuſted and adapted, with proper Sight and a good Pedeſtal; and I cannot help thinking, that if Men would ſet about it in good earneſt, they need not fear to meet with good Succeſs at Sea, ſince I have been informed by a ſkillful Commander, who took one along with him, in an India Voyage, that accuſtomed himſelf to it often, he could at laſt at ſome certain Times, make uſe of it with good Succeſs.

In the ſecond Volume of my Syſtem of the Mathematicks, Page 283 and 284, I have ſhewn a Way to find the true Time of the viſible riſing and ſetting of the Sun, or of his Center; by making Allowance for his horizontal Refraction, which is ſo great in our Latitude, as to cauſe the Sun at that Time of the Year, to which the Calculation is fitted, to riſe apparently 4 Minutes, 10 Seconds ſooner than is found by the common Methods of Computation, and to ſet ſo much later: And as this Method will never fail to give the true Time of the apparent riſing and ſetting of the Sun at all Time, and in all Places, to a great Degree of Exactneſs; and as the ſame Method of Inveſtigation is applicable to the fixed Stars, I know of no Way at preſent, that is ſo apt, and will anſwer the intended Purpoſe ſo well, as this will do. For as it requires no Inſtruments to obſerve when the Sun or Stars viſibly riſe or ſet,

nor

nor any great Skill in the Obſerver, but only a diligent and careful looking out, and watching when the Sun or Star begins to appear or diſappear, which any one is capable of doing; and conſidering that there are frequent Opportunities whenever the Heavens are clear, and which is the only Time that we have Occaſion for it, for making Obſervations, there is ſcarce a Night can happen, but we may have an Opportunity of knowing the true Time, and be able to give a ſatisfactory Account when any remarkable appearance becomes viſible.

But to return to the preſent Affair, as Mr *Flamſteed's* Tables of the Satellites never yet appeared in Print, though at Times he diſpoſed of ſome few Copies, one of which I made for the Uſe of a particular Gentleman, ſo the Reader cannot judge what Improvements have been made to them, but this I can aſſure him, that the mean Motions have been well adjuſted by the Compariſon of ſeveral good Obſervations, made at the Diſtance of upwards of four entire Revolutions of *Jupiter* in his Orb, as he will ſee in the Courſe of the Work, that the Tables in general have received ſome Corrections, and ſome uſeful ones added, which were not in his, whence they may not improperly be called *New Tables.*

In compoſing a Work of this Nature, which requires ſome Skill, and a vaſt Number of Calculations, wherein I have had no Aſſiſtance from any Perſon whatſoever, if through my eager Purſuit, for the Benefit of others, I have been guilty of ſome Over-ſights, I perſuade myſelf that the candid Reader will paſs a favourable Sentence upon them, as he would have done to himſelf, was he in my Caſe; and I do aſſure him, that I ſhall receive an Account of them with a grateful Acknowledgment.

And here I cannot help taking Notice of a great Hardſhip that I labour under, and that is this.

Mr *Flamſteed*, under whom I had the Happineſs of my Education, was pleaſed to ſet me upon computing his Lunar Tables, under his Direction, when I computed the Tables of the central Equations of the Moon, after the *Keplerian* Method, which had never been done before; and in Conſideration of the Labour I had taken in this, as well as in calculating the Latitudes and Longitudes of all the Stars in the *Britiſh* Catalogue, which amount to upwards of 3000, and in other innumerable Calculations, and ſome other Motives, he was pleaſed to appoint me one of his Executors, and at the ſame

Time thought proper to recommend to me the Care of compleating and publiſhing of what he had left undone, which I have performed with all the Integrity in my Power; but as to the Lunar Tables, the Publication of them was delayed for very good Reaſons, and now, to my great Surprize, I find them printed in Mr *Monnier*'s *Inſtitutions Aſtronomiques*, but how he came by them, is to me at preſent a Miſtery.

Mr *Flamſteed* was in himſelf a Man of a very communicative Temper to thoſe he took a liking to, and whom he thought he could truſt; and I know two Perſons, to whom he gave each a Copy, but how after upwards of twenty Years, when it was well known that I had the Originals by me, and did at a convenient Time, intend to ſend them into the World, according to Mr *Flamſteed*'s own Directions; it was baſe and diſingenuous, to ſay no worſe, in them, whoever they were, and who had no right to them, to betray their Truſt, and deprive me of the Satisfaction of complying with the Requeſt of my Friend, and printing them according to his own Mind.

THE

THE

THEORY

OF

Jupiter's Satellites.

THE Satellites of Jupiter were first discovered by *Galileus*, an Italian, after the Invention of Telescopes, about the Year 1610.

As the Moon revolves about the Earth, her primary Planet, in a certain Period of Time; so the Satellites revolve about Jupiter, their primary Planet, in certain Periods of Time.

The first or innermost Satellite of Jupiter, revolves about his Orb in 1 Day, 18 Hours, 27 Minutes, and 34 Seconds; whence his mean Motion for 1 Day, is 6 Signs, 23 Degrees, 29 Minutes, and 20 Seconds; for one Hour, 8 Degrees, 28 Minutes, and 43 Seconds; for 1 Minute, 8 Minutes and 29 Seconds; for 1 Second of Time, 8 Seconds and 29 Thirds: And for one common Julian Year, 3 Signs, 23 Degrees, 28 Minutes, and 46 Seconds, &c.

The second Satellite finishes his Revolution in 3 Days, 13 Hours, 13 Minutes, and 42 Seconds; whence his mean Motion for 1 Day,

 is

is 3 Signs, 11 Degrees, 22 Minutes, and 29 Seconds; for 1 Hour, 4 Degrees, 13 Minutes, and 26 Seconds; for 1 Minute, 4 Minutes and 13 Seconds; for 1 Second, 4 Seconds and 13 Thirds: And for one Julian Year, 9 Signs, 11 Degrees, 47 Minutes, and 36 Seconds, &c.

The third Satellite performs his Revolution in 7 Days, 3 Hours, 42 Minutes, and 33 Seconds; whence his mean Motion for 1 Day, is 1 Sign, 20 Degrees, 19 Minutes, and 3 Seconds; for 1 Hour, 2 Degrees, 5 Minutes, and 48 Seconds; for 1 Minute, 2 Minutes and 6 Seconds; for 1 Second, 2 Seconds and 6 Thirds: And for 1 Julian Year, 5 Degrees, 56 Minutes, and 10 Seconds, &c.

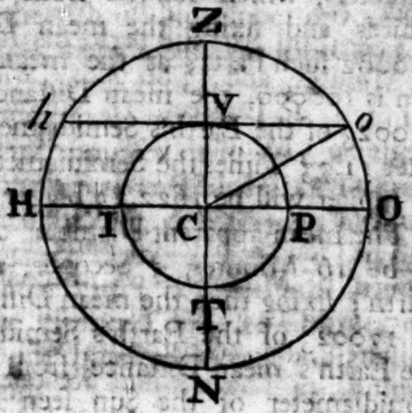
The fourth Satellite compleats his Revolution in 16 Days, 16 Hours, 21 Minutes, and 1 Second; whence his mean Motion for 1 Day, is 21 Degrees, 34 Minutes, and 16 Seconds; for 1 Hour, 53 Minutes, and 56 Seconds; for 1 Minute, 54 Seconds; and for 1 Second, 54 Thirds: And for one Julian Year, 10 Signs, 13 Degrees, 27 Minutes, and 22 Seconds, &c.

Jupiter performs his Revolution in 11 Years and 313 Days; or 4330 Days, 8 Hours, 38 Minutes, and 24 Seconds, in which Time he returns to the same Place in his Orb from whence he began to move; whence his diurnal mean Motion will be 4 Minutes and 59 Seconds, for 1 Hour, 12 Seconds, &c. And hence arises another Revolution of the Satellites, taken Notice of by Astronomers; that is, the Time that any one of the Satellites requires to move from one Conjunction of the Satellite with Jupiter, till it is in Conjunction with him again; and this is called the Synodical Revolution. This in the first Satellite is performed in the Space of 1 Day, 18 Hours, 28 Minutes, and 35 Seconds; in the second Sattellite, in 3 Days, 13 Hours, 17 Minutes, and 53 Seconds; in the third, in 7 Days, 3 Hours, 59 Minutes, and 37 Seconds; in the fourth, in 16 Days, 18 Hours, 5 Minutes, and 4 Seconds; and these are likewise the Periods of Eclipses, since after this Interval of Time the Eclipses of each of the Satellites return again.

The Orbits of these Satellites differ but insensibly from Circles concentrick to Jupiter, and their Motions are found to be nearly equable and uniform.

Mr *Pounds*, by Observations made with a large Glass and good Micrometers, found the greatest Elongation of the first Satellite from Jupiter, or the Semidiameter of it's Orb, to be 5.965 Semidiameters

meters of Jupiter; of the second Satellite, to be 9.494 of the same Measure; of the third, to be 15.141; and of the fourth, to be 26.63 of Jupiters Semidiameters; whence to find the respective Parallaxes of each of their Orbs: In the adjacent Figure let ZONH represent the Orb of one of the Satellites, suppose the first; JVPT the Body of Jupiter; C his Centre; HCO the true Horizon; *h*V*o* the vizible Horizon: Then in the Triangle CV*o*, right angled at V, are given C*o*, the Semi-Diameter of the Orb of the Satellite, CV the Semidiameter of Jupiter; whence to find the Angle C*o*V, equal to the Angle OC*o*, the Horizontal Parallax, it will be, as C*o* : R :: CV : S, ∠C*o*V = ∠OC*o*; that is,



As the Semi-diameter of the Orb of the Satellite 5.965, - - - - - - - - - - - - -	0.7756104
To the Radius - - - - - - - - - - - - - - -	10.0000000
So is the Semi-Diameter of Jupiter = 1 - - - - -	0.0000000
To the Sign of the Parallactic Angle 9 Degrees, 39 Minutes, and 3 Seconds, - - - -	9.2243896

And by proceeding after the same Manner, the Parallax of the Orb of the second Satellite will be found to be 6 Degrees, 2 Minutes, and 46 Seconds; of the third, to be 3 Degrees, 47 Minutes, and 12 Seconds; and of the fourth Satellite, to be 2 Degrees, 9 Minutes, and 8 Seconds.

Besides these Periodic Revolutions of the Satellites about their Primary Planet Jupiter, they seem to revolve about their own Axes as the other Planets do; this appears from the same Satellite shining brighter at one Time than at another, and that when one of them hath appeared with it's utmost Splendor, the Light of another has been considerably diminished; from whence it is farther probable, that some Parts of their Surfaces do very faintly (if at all) reflect the Solar Rays to us, as has been taken Notice of by several Astronomers.

The

The apparent Semidiameter of Jupiter, viewed from the Earth, at her mean Diſtance, which is nearly equal to Jupiter's Horizontal Parallax, is 18 Seconds, 37 Thirds and ½; Now ſuppoſing the Diſtance of the Earth from the Sun to be 25000 of her Semidiameters, which follows from a Parallax of 8 Seconds and 15 Thirds, and fixing the mean Diſtance of Jupiter from the Sun 520092 ſuch Parts; as the mean Diſtance of the Earth from the Sun is 100000, the mean Diſtance of Jupiter from the Sun will be 130023 of the Earth's Semidiameters, and the Semidiameter of Jupiter 11.75 Times the Semidiameter of the Earth; whence the Body of Jupiter will be 1622.25 bigger than the Body of the Earth.

The mean apparent Diameter of the Sun, is found by Obſervation to be 16 Minutes, 5 Seconds, and 15 Thirds, viewed from the Earth; fixing then the mean Diſtance of Jupiter from the Sun, to be 130023 of the Earth's Semidiameters; or 520092 ſuch Parts as the Earth's mean Diſtance from the Sun is 100000; the apparent Semidiameter of the Sun ſeen from Jupiter, will be 3 Minutes, 5 Seconds, 33 Thirds, and 31 Fourths; from which ſubtracting 18 Seconds, 37 Thirds, and 30 Fourths, Jupiter's Horizontal Parallax; the Remainder, 2 Minutes, 46 Seconds, 56 Thirds, and 1 Fourth, will be the Semi-Angle of the Cone of Jupiter's Shadow; whence the Length of the Axis will be determined at 1235 of Jupiter's Semidiameters.

Now in order to adjuſt the mean Motions of the Satellites as near the Truth as poſſible, I find that by comparing an Immerſion of the firſt Satellite of Jupiter, obſerved at *Greenwich* on the 8th of September 1677, at 11^{h}, 36^{m}, 20^{s}, *p. m.* (ſee the Collection of Obſervations at the End of the Book) with an Obſervation of an Immerſion of the ſame Satellite, made at *Pekin* in *China*, and *Peterſburgh* in *Ruſſia*, on the 21ſt of November 1727, at 6 Hours, 34 Minutes, and 13 Seconds, after an Interval of 50 Years, as well as by ſeveral other Compariſons of the ſame Kind, that the firſt Satellite moves ſwifter by 3 Minutes and 42 Seconds each Year, than Mr *Flamſteed* ſuppoſed it to do; whence I have fixed it's mean Motion for one Year, at 3 Signs, 23 Degrees, 28 Minutes, and 46 Seconds; for two Years, 7 Signs, 16 Degrees, 57 Minutes, and 32 Seconds; for three Years, 11 Signs, 10 Degrees, 26 Minutes, and 18 Seconds; for four Years, 9 Signs, 27 Degrees, 24 Minutes, and 24 Seconds; for twenty Years, 1 Sign, 17 Degrees, and 2 Minutes; and for one

one hundred Years, 7 Signs, 25 Degrees, and 10 Minutes, exactly.

Again, by comparing an Immerſion of the ſecond Satellite, obſerved at *Greenwich* on the 11th of December 1681, at 8 Hours, 32 Minutes, and 41 Seconds, *p. m.* with an Immerſion of the ſame Satellite obſerved at *Pekin* in *China*, the 6th of November 1729, at 3 Hours, 51 Minutes and 28 Seconds, reduced to the Meridian of *Greenwich*, as well as by ſeveral other Compariſons of the ſame Kind, I find that the ſecond Satellite moves 24 Seconds and 32 Thirds ſlower each Year than Mr *Flamſtead* ſuppoſed it to do; whence I have fixed it's mean Motion for one Year, at 9 Signs, 11 Degrees, 47 Minutes, and 56 Seconds; for two Years, 6 Signs, 23 Degrees, 35 Minutes, and 52 Seconds; for three Years, 4 Signs, 5 Degrees, 23 Minutes, and 48 Seconds; for four Years, 4 Signs, 28 Degrees, 34 Minutes, and 13 Seconds; for twenty Years, 22 Degrees, 51 Minutes, and 5 Seconds; and for one hundred Years, 3 Signs, 24 Degrees, 15 Minutes, and 25 Seconds.

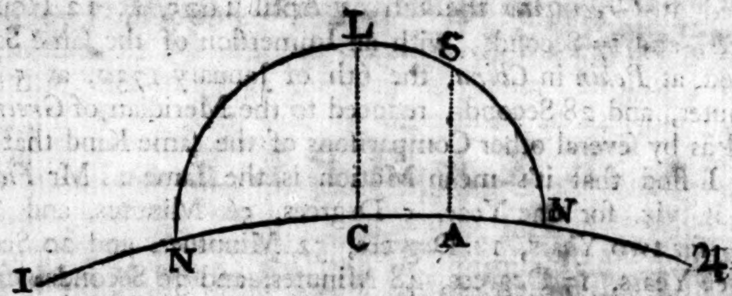
In like manner by comparing an Immerſion of the third Satellite, obſerved at *Greenwich* the 8th of April 1695, at 12 Hours, 20 Minutes, and 17 Seconds; with an Immerſion of the ſame Satellite, obſerved at *Pekin* in *China*, the 6th of January 1730, at 5 Hours, 6 Minutes, and 28 Seconds, reduced to the Meridian of *Greenwich*; as well as by ſeveral other Compariſons of the ſame Kind that I have made, I find that it's mean Motion is the ſame as Mr *Flamſtead* made it, viz. for one Year, 5 Degrees, 56 Minutes, and 10 Seconds; for two Years, 11 Degrees, 52 Minutues, and 20 Seconds; for three Years, 17 Degrees, 48 Minutes, and 30 Seconds; for four Years, 2 Signs, 14 Degrees, 3 Minutes, and 13 Seconds; for twenty Years, 10 Degrees, 18 Minutes, and 35 Seconds; and for one hundred Years, 1 Sign, 21 Degrees, 32 Minutes, and 55 Seconds.

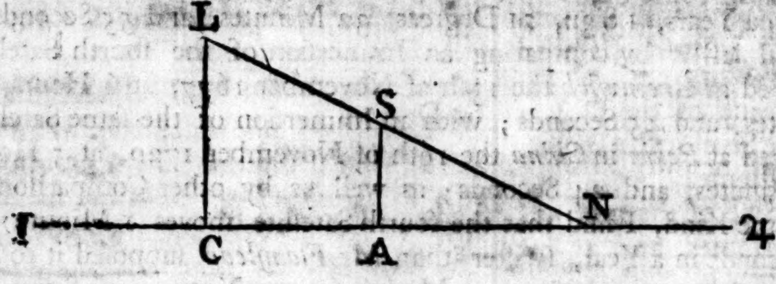
And laſtly, by comparing an Immerſion of the fourth Satellite, obſerved at *Greenwich* the 13th of November 1677, at 6 Hours, 45 Minutes, and 45 Seconds; with an Immerſion of the ſame Satellite, obſerved at *Pekin* in *China* the 19th of November 1729, at 5 Hours, 20 Minutes, and 24 Seconds; as well as by other Compariſons of the ſame Kind, I find that the fourth Satellite moves 1 Minute and 18 Seconds in a Year, ſwifter than Mr *Flamſtead* ſuppoſed it to do; whence I have fixed it's mean Motion for one Year, at 10 Signs, 13 Degrees, 28 Minutes, and 22 Seconds; for two Years, 8 Signs, 26

Degrees, 54 Minutes, and 44 Seconds; for three Years, 7 Signs, 10 Degrees, 22 Minutes, and 6 Seconds; for four Years, 6 Signs, 15 Degrees, 23 Minutes, and 44 Seconds; for twenty Years, 8 Signs, 16 Degrees, 58 Minutes, and 40 Seconds; and for one hundred Years, 6 Signs, 24 Degrees, 53 Minutes, and 20 Seconds.

Suppose in PROBLEM the First,

THE Inclination of the Orb of any one of the Satellites of Jupiter, to the Plane of his Orb, or the Satellite's greatest Latitude; as also, the Satellite's Distance from the Node to be given to find the Satellites present Latitude.





SOLUTION.

SOLUTION.

LEt INCAN represent a Part of the Orb of Jupiter, NLSN a Part of the Orb of one of the Satellites, N, N the Nodes, L the Limit, S the Place of the Satellite in it's Orb.

From the Points L and S, draw the Arches LC and SA, perpendicular to the Plane of Jupiter's Orb; then will LC be the Measure of the Inclination of the Orb of the Satellite, to the Orb of Jupiter, or the Satellite's greatest Latitude, SA it's present Latitude, and because the spherical Triangles LNC and SNA, right angled at C and A, have the Angle LNC, common to both the Triangles; it will be, As the S, LN : S, SN : : S, LC : S, SA; that is, As the Radius (because LN is a Quadrant) is to the Sine of the Distance of the Satellite from it's Node, So is the Sine of the Inclination of the Orb, or the Satellite's, greatest Latitude, to the Sine of it's present Latitude.

EXAMPLE.

SUPPOSE the Inclination of the Orb of one of Jupiter's Satellites, to the Plane of Jupiter's Orb, or the Satellite's greatest Latitude, be 2 Degrees and 40 Minutes; and it be required to find the Satellite's Latitude, at the Distance of 60 Degrees, or 2 Signs, from the Node, it will be,

As the Radius - - - - - - - - - - - -	10.0000000
To the Sine of the Distance 60 Degrees - - - -	9.9375306
So is the Sine of the Inclination 2 Degrees and 40 Minutes - - - - - - - - -	8.6676893
To the Sine of the present Latitude 2 Degrees, 18 Minutes, and 33 Seconds - - -	8.6052199

After

After the ſame Manner may the Latitude of the Satellite, at any other Diſtance from the Node or Argument of Latitude be found.

And inaſmuch as the Points of 2 Signs, 4 Signs, 8 Signs, and 10 Signs, are at equal Diſtances from the Node, the ſame Latitude of 2 Degrees, 18 Minutes, and 33 Seconds, is common to thoſe ſeveral Points; but as 2 Signs, and 4 Signs, are in the Northern Semicircle, when the Satellite is in thoſe Points, the Latitude is North; and on the contrary, as the Signs 8 and 10 are in the Southern Semicircle, when the Satallite is in either of theſe Signs, the Latitude is South; and after this Manner is the Table ſhewing the Latitudes of the Satellites, at every ſingle Degree of their Diſtance from the Node of Jupiter conſtructed.

And the ſame Rule extends to find the preſent heliocentrick Latitude of any of the ſuperior Planets, the Inclination of their Orbs to the Plane of the great Orb being given.

PROBLEM the Firſt, CASE the Second.

LET us now ſuppoſe the greateſt Latitude or Inclination of the Orb of the Satellite, and it's preſent Latitude, to be given, to find the Diſtance of the Satellite from it's Node, or it's Argument of Latitude; that is, in the ſpherical Triangle SAN, are given SA the preſent Latitude, and the Angle SNA the Inclination of the Orb, together with the right Angle SAN; whence to find SN the Diſtance required, it will be by the Rules for ſpherical Triangles;

As S, ∠ SNA : R :: S, SA : S, SN; that is, As the Sine of the Inclination of the Orb is to the Radius, So is the Sine of the preſent Latitude to the Sine of the Diſtance of the Satellite from the Node.

EXAMPLE.

SUPPOSE the Inclination of the Orb of the Satellite to be 2 Degreees and 40 Minutes, and the preſent Latitude to be 1 Degree

gree, 57 Minutes; and it be required to find the Distance of the Satellite from it's Node, it will be,

As the Sine of the Inclination 2 Degrees and 40 Minutes - - - - - - - - - - - - -	8.6676893
To the Radius - - - - - - - - - - - - - - - - - -	10.0000000
So is the Sine of the present Latitude 1 Degree and 57 Minutes - - - - - - - - - -	8.5318281
To the Sine of the Satellite's Distance from it's Node 47 Degrees - - - - - - - -	9.8641388

Which answers to 1 Degree and 17 Minutes, if the Satellite be in the first Quadrant, or Quarter; to 4 Sines and 13 Degrees, if the Satellite be in the second Quadrant; to 7 Signs and 17 Degrees, if the Satellite be in the third Quadrant; and to 10 Signs and 13 Degrees, if the Satellite be in the fourth Quadrant.

PROBLEM the First, CASE the Third.

GIVEN the Satellite's Distance from the Node, and it's present Latitude, to find it's greatest Latitude or Inclination of it's Orb; that is, in the spherical Triangle SAN, right angled at A, are given SA the present Latitude, and the Hypothenuse SN, the Distance of the Satellite from the Node, to find the Angle SNA, the Inclination of the Orb; whence by the Rules of spherical Triangles it will be, As the Sine of the Distance of the Satellite from the Node, is to the Radius; so is the Sine of the present Latitude, to the Sine of the greatest Latitude or Inclination of the Orb.

EXAMPLE.

SUPPOSE at the Distance of 1 Sine and 17 Degrees, or 47 Degreees from the Node, the Satellite's Latitude being 1 Degree

 and

and 57 Minutes; and it be required to find the greatest Latitude, it will be,

As the Sine of the Satellite's Distance from the Node 47 Degrees - - - - - - - - - - -	9.8641275
To the Radius - - - - - - - - - - - - - - - - - -	10.0000000
So is the Sine of it's present Latitude 1 Degree and 57 Minutes - - - - - - - - - - -	8.5318281
To the Sine of the greatest Latitude or Inclination 2 Degrees and 40 Minutes - - - - -	8.6677006

These two last Cases are applicable to all the superior Planets.

PROBLEM the Second.

GIVEN the periodical Return of any one of the Satellites, to find how long the same Satellite will pass over any given Part of the Orb.

SOLUTION.

AS 360 Degrees, the intire Circumference of the Orb, is to the Time of the Satellite's Revolution; so is the given Arch of the Orb, to the Time the Satellite requires to pass over it.

EXAMPLE.

SUPPOSE the first Satellite of Jupiter revolves about Jupiter in the Space of 1 Day, 18 Hours, 28 Minutes, and 30 Seconds; and it be required to find how long the same Satellite will require to pass over an Arch 9 Degrees and 49 Minutes; say, If 360 Degrees give 1 Day, 18 Hours, 28 Minutes, and 30 Seconds, what will 9 Degrees and 49 Minutes; and it will be found by the Rule of Three to be 1 Hour, 9 Minutes, and 29 Seconds.

CASE

CASE the Second.

GIVEN the Time of the Revolution of a Satellite, to find what Part of the Orb the Satellite will move over, in any given Time; *say*, As the intire Revolution of the Satellite, is to the whole Circumference of the Orb; so is the given Time to the Arch the Satellite will move over in that Time.

EXAMPLE.

SUPPOSE the first Satellite revolves about Jupiter in 1 Day, 18 Hours, 28 Minutes, and 30 Seconds, what Arch of the Orb will it revolve about in 1 Hour, 9 Minutes, and 28 Seconds; and it will be found by saying, As 1 Day, 18 Hours, 28 Minutes, and 30 Seconds, is to 360 Degrees; so is 1 Hour, 9 Minutes, and 29 Seconds, to 9 Degrees and 49 Minutes; and the same Rule may be applied to any other of the Satellites.

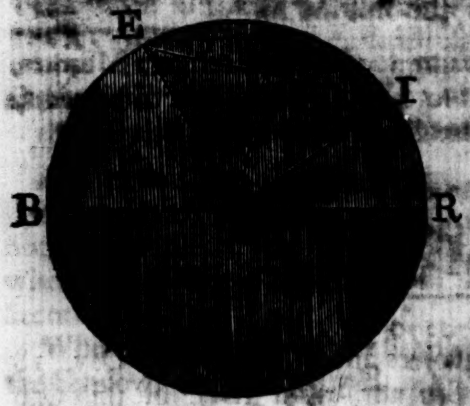
Hence the Duration of an Eclipse, or the Time between the Immersion and Emersion of any Satellite being given, the Length of the Part of the Orb that the Satellite will pass over in that Time, may be found; and *vice versa*, the Portion of the Orbit being given, the Time that the Satellite requires to pass over is easily had.

PROBLEM the Third.

GIVEN the present Latitude of any one of the Satellites, and the Breadth of Jupiter's Shadow, in that Part of the Cone thro' which it's Orbit passes, to find the Duration of the Eclipse, or how

how long Time the Satellite will require to pass over that Part of the Orb which passes thro' the Shadow.

Let the Circle BEIR represent the Section of the Cone of Jupiter's Shadow in that Part, where the Orbit of the Satellite passes through; and let the Line EMI be the Part of the Orb that passes thro' it, then will I be the Point of Immersion, E the Point of Emersion, M the Middle, and the Line EMI the total Duration; also, CM the present Latitude of the Satellite: Then in the right angled plain Triangle MCI, right angled at M, are given CI the Breadth of the Shadow, MC the Latitude of the Satellite; whence by the Seventh Case of plain Triangles, may the Side MI, the Semiduration of the Eclipse, be found.



EXAMPLE.

LET it be required to find the Duration of an Eclipse of the first Satellite of Jupiter, or how long the said Satellite will be passing thro' the Shadow, the Satellite having 1 Degree and 57 Minutes Latitude, the Breadth of the Shadow being 9 Degrees and 49 Minutes.

Now in the right angled plain Triangle MCI, right angled at M, we have given the Hypothenuse CI, equal to 9 Degrees and 49 Minutes, or 589 Minutes; CM equal to 1 Degree and 57 Minutes, or 117 Minutes; when to find MI by the Seventh Case of plain Triangles:

To

To the Logarithm of 706, the Sum of the Sides CP and PM - - - -	2.8488047
Add the Logarithm of 472, the Difference of the same Sides CP and PM - - - - - - - - - - -	2.6739419
	5.5227467
Half the Sum of these two Logarithms, will give the Logarithm of 577 for the Side MP	2.7613733

Whence to find the Time answering to the Arch of 577 Minutes, we must say, As 360 Degrees is to 1 Day, 18 Hours, 28 Minutes, and 30 Seconds, so is 577 Minutes to the Time; that is,

Minutes. Seconds. Minutes.

As 21600 : 152910 : : 577

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              577
          ———————
          1070370
         1070370
         764550          6|0
        ———————
216)882290|70(408|4
      1829                68.4
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       146
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Whence the Semiduration of the Eclipse, will be found to be 1 Hour, 8 Minutes, and 4 Seconds; and consequently the whole, 2 Hours, 16 Minutes, and 8 Seconds.

EXAMPLE the Second.

LET it be required to find the Duration of an Eclipse of the fourth Satellite of Jupiter, the Breadth of the Shadow being 2 Degrees and 11 Minutes, and the Satellite's Latitude 1 Degree and

 57 Minutes;

57 Minutes; the Side CI is 2 Degrees and 11 Minutes, or 131 Minutes; and the Side CM 1 Degree and 57 Minutes, or 117 Minutes; whence to find MI, or MB,

To the Logarithm of 248, the Sum of the Sides CI and CM, - - - - - - - - -	2.3944517
Add the Logarithm of 14, the Difference of the Sides CI and CM, - - -	1.1461280
	3.5405797
Half the Sum of these two Logarithms will be the Logarithm of 59, the Semiduration -	1.7702898

And to find the Time answering to it, it will be, As 360 Degrees is to 16 Days, 18 Hours, 5 Minutes, and 7 Seconds, so is 59 Minutes to 1 Hour, 5 Minutes, and 52 Seconds, the Semiduration; whence the whole Duration will be 2 Hours, 11 Minutes, and 44 Seconds.

When the Latitude of the Satellite becomes equal to the Breadth of the Shadow, the Satellite will just touch the Shadow; and after that, will continue to pass wide of the Shadow, and no Eclipse will happen. Now inasmuch as the Breadth of the Shadow where the Orbit of the fourth Satellite intersects the Cone of Jupiter's Shadow, is but 2 Degrees and 11 Minutes, and the greatest Latitude of the same Satellite is 2 Degrees and 40 Minutes; it follows, that for some Time before and after the Limit, the Satellite will pass wide of the Shadow, and there will be no Eclipse; and to find when this will happen, we must reason after the Manner taught in the second Case of the first Problem, by saying,

As the Sine of the greatest Latitude or Inclination 2 Degrees and 40 Minutes - - - -	8.6676893
To the Sine of the present Latitude 2 Degrees and 11 Minutes - - - - - - - - - -	8.5808923
So is the Radius - - - - - - - - - - - - - -	10.0000000
To the Sine of the Distance of the Satellite -	9.9132030

From the Node 54 Degrees and 59 Minutes, or to the Cosine of the Distance from the Limit 35 Degrees and 1 Minute.

Whence it follows, that placing the Nodes of the Satellite as Mr. *Flamsteed* has done, in 10 Degrees of *Aquarius*, and 10 Degrees

of *Leo*; whence the Place of the Limit will be in 10 Degrees of *Scorpio* and *Taurus*, that during the Time the fourth Satellite is passing over an Arch of 35 Degrees and 1 Minute, on each Side of the Limits; that is, whilst he is passing from 5 Degrees in *Aries* (rejecting the 1 Minute as useless) to 15 Degrees in *Gemini*, and from 5 Degrees in *Libra*, 'till he comes into 15 Degrees of *Sagittary*; that is, for 2 Years at each Limit; that is, for 4 Years in the whole; that is, for one Third of his whole Revolution, the Satellite passes wide of the Shadow, and there are no Eclipses.

N. B. These Calculations are grounded upon Mr *Flamsteed*'s old Satellite Tables; but the same Methods of proceeding will hold good in whatsoever Manner the Numbers are changed, or how much soever they are altered.

TABLES

TABLES

For Computing the

ECLIPSES

OF

Jupiter's Satellites.

By *J. H.*

E

A TABLE of Roots of the mean

Tab. I.

Years Comp.	M. M. ♃ s.	°	′	″	M. M. Aph. s.	°	′	″
1	1	0	20	38	0	0	1	12
2	2	0	41	16	0	0	2	24
3	3	1	1	54			3	36
4	4	1	27	31			4	48
5	5	1	48	9			6	0
6	6	2	8	47			7	12
7	7	2	29	26			8	24
8	8	2	55	3			9	36
9	9	3	15	41			10	48
10	10	3	36	19			12	0
11	11	3	56	57			13	12
12	0	4	22	34			14	24
13	1	4	43	13			15	36
14	2	5	3	51			16	48
15	3	5	24	29			18	0
16	4	5	50	6			19	12
17	5	6	10	44			20	24
18	6	6	31	22			21	36
19	7	6	52	0			22	48
20	8	7	17	38			24	0
40	4	14	35	16			48	0
60	0	21	52	54		1	12	0
80	8	26	10	32		1	36	0
100	5	6	28	11		2	0	0
200	10	12	56	22		4	0	0
300	3	19	24	33		6	0	0
400	8	25	52	44		8	0	0
500	2	2	20	55		10	0	0
600	7	8	49	6		12	0	0
700	0	15	17	17		14	0	0
800	5	21	45	28		16	0	0
900	10	28	13	39		18	0	0
1000	4	4	41	50		20	0	0
2000	8	9	23	40	1	10	0	0
3000	0	4	5	30	2	0	0	0

Tab. II.

Years of Christ	M. M. ♃ s.	°	′	″	M. M. Aph. s.	°	′	″
1701	10	17	9	10	6	9	35	0
02	11	17	29	48			36	12
03	0	17	50	26			37	24
04	1	18	11	4			38	36
05	2	18	36	41			39	48
06	3	18	57	19			41	00
07	4	19	17	58			42	12
08	5	19	38	36			43	24
09	9	20	4	13			44	36
10	7	20	24	50			45	48
11	8	20	45	28			47	00
12	9	21	6	7			48	12
13	10	21	31	44			49	24
14	11	21	52	23			50	36
15	0	22	13	1			51	48
16	1	22	33	39			53	00
17	2	22	59	16			54	12
18	3	23	19	54			55	24
19	4	23	40	32			56	36
20	5	24	1	10			57	39
21	6	24	26	48			59	00
22	7	24	47	26	6	10	0	12
23	8	25	8	4			1	24
24	9	25	28	42			2	36
25	10	25	54	19			3	48
26	11	26	14	57			5	00
27	0	26	35	35			6	12
28	1	26	56	14			7	24
29	2	27	21	51			8	36
30	3	27	42	29			9	48
31	4	28	3	7			11	00
32	5	28	23	45			12	12
33	6	28	49	22			13	24
34	7	29	10	0			14	36
35	8	29	30	39	6	10	15	48

Motions of Jupiter, for the Years of Christ current.

Tab. III.

Years of Christ.	M. M. ♃ s.	°	'	''	M. M. Aph. s.	°	'	''
1736	9	29	51	17	6	10	17	0
37	11	0	16	54			18	12
38	0	0	37	32			19	24
39	1	0	58	10			20	36
40	2	1	18	51			21	48
41	3	1	44	26			23	0
42	4	2	5	4			24	12
43	5	2	25	42			25	24
44	6	2	46	20			26	36
45	7	3	11	57			27	48
46	8	3	32	35			29	0
47	9	3	53	13			30	12
48	10	4	13	52			31	24
49	11	4	39	29			32	36
50	0	5	0	7			33	48
51	1	5	20	45			35	0
52	2	5	41	23			36	12
53	3	6	7	0			37	24
54	4	6	27	39			38	36
55	5	6	48	17			39	48
56	6	7	8	55			41	0
57	7	7	34	32			42	12
58	8	7	55	10			43	24
59	9	8	15	48			44	36
60	10	8	36	26			45	48
61	11	9	2	4			47	0
62	0	9	22	42			48	12
63	1	9	43	20			49	24
64	2	10	3	58			50	36
65	3	10	29	35			51	48
66	4	10	50	13			53	0
67	5	11	10	52			54	12
68	6	11	31	30			55	24
69	7	11	57	7			56	36
70	8	12	17	45	6	10	57	48

Tab. IV.

Years of Christ.	M. M. ♃ s.	°	'	''	M. M. Aph. s.	°	'	''
1771	9	12	38	23	6	10	59	0
72	10	12	59	1	6	11	0	12
73	11	13	24	38			1	24
74	0	13	45	17			2	36
75	1	14	5	55			3	48
76	2	14	26	33			5	0
77	3	14	52	10			6	12
78	4	15	12	48			7	24
79	5	15	33	26			8	36
80	6	15	54	4			9	48
81	7	16	19	42			11	0
82	8	16	40	20			12	12
83	9	17	0	58			13	24
84	10	17	21	36			14	36
85	11	17	47	13			15	48
86	0	18	7	51			16	0
87	1	18	28	29			17	12
88	2	18	49	7			18	24
89	3	19	14	45			19	36
90	4	19	35	23			20	48
91	5	19	56	1			22	0
92	6	20	16	39			23	12
93	7	20	42	16			24	24
94	8	21	2	54			25	36
95	9	21	23	33			26	48
96	10	21	44	11			28	0
97	11	22	9	48			29	12
98	0	22	30	26			30	24
99	1	22	51	4			31	36
1800	2	23	11	42			32	48
01	4	23	37	20			35	0
02	4	23	57	58			36	12
03	5	24	18	36			37	24
04	6	24	39	14			38	36
05	7	25	4	51	6	11	39	48

A TABLE of the mean Motions of Jupiter, for

Tab. V.

Days	January			February			March			April			May			June			July			August			Days
	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	
1	0	4	59	2	39	37	4	59	17	7	33	54	10	3	33	12	38	10	15	7	48	17	42	26	1
2		9	59		44	37	5	4	17		38	54		8	32		43	10		12	47		47	26	2
3		14	58		49	36		9	16		43	53		13	31		48	9		17	47		52	25	3
4		19	57		54	35		14	15		48	52		18	30		53	8		22	46		57	24	4
5		24	56		59	34		19	14		53	51		23	29		58	7		27	45	18	2	23	5
6		29	56	3	4	34		24	14		58	51		28	29	13	3	7		32	45		7	23	6
7		34	55		9	33		29	13	8	3	50		33	28		8	6		37	44		12	22	7
8		39	54		14	32		34	12		8	49		38	27		13	5		42	43		17	21	8
9		44	53		19	31		39	11		13	48		43	26		18	4		47	42		22	20	9
10		49	53		24	31		44	11		18	47		48	26		23	4		52	42		27	20	10
11		54	52		29	30		49	10		23	46		53	26		28	3		57	41		32	19	11
12		59	51		24	29		54	9		28	46		58	24		33	2	16	2	40		37	18	12
13	1	4	50		39	28		59	8		33	45	11	3	23		38	1		7	39		42	17	13
14		9	50		44	28	6	4	8		38	45		8	23		43	1		12	39		47	17	14
15		14	49		49	27		9	7		43	44		13	22		48	0		17	38		52	16	15
16		19	48		54	26		14	6		48	44		18	21		52	59		22	37		57	15	16
17		24	48		59	26		19	6		53	43		23	21		57	59		27	37	19	2	15	17
18		29	47	4	4	25		24	5		58	42		28	20	14	2	58		32	56		7	14	18
19		34	46		9	24		29	4	9	3	42		33	19		7	57		37	35		12	13	19
20		39	45		14	23		34	3		8	41		38	18		12	56		42	34		17	12	20
21		44	45		19	23		39	3		13	40		43	18		17	56		47	34		22	12	21
22		49	44		24	22		44	2		18	39		48	17		22	55		52	33		27	12	22
23		54	43		29	21		49	1		23	38		53	16		27	54		57	32		32	10	23
24		59	42		34	20		54	0		28	37		58	15		32	53	17	2	31		37	9	24
25	2	4	42		39	20		59	0		33	37	12	3	15		37	53		7	31		42	9	25
26		9	41		44	19	7	3	59		38	36		8	14		42	52		12	30		47	8	26
27		14	40		49	18		8	58		43	35		13	13		47	51		17	29		52	7	27
28		19	39		54	17		13	58		48	35		18	13		52	51		22	29		57	7	28
29		24	39					18	57		53	34		23	12		57	50		27	28	20	2	6	29
30		29	38					23	56		58	33		28	11	15	2	49		32	27		7	5	30
31		34	38					28	56					33	11					37	27		12	5	31

Month, Days, Hours, Minutes, and Seconds.

Tab. V.

Days	September			October			November			December			Days
	°	'	''	°	'	''	°	'	''	°	'	''	
1	20	17	4	22	46	43	25	21	21	27	51	0	1
2		22	4		51	43		26	21		55	59	2
3		27	3		56	42		31	20	28	0	58	3
4		32	2	23	1	41		36	19		5	57	4
5		37	1		6	40		41	18		10	56	5
6		42	1		11	39		46	18		15	56	6
7		47	0		16	38		51	17		20	55	7
8		51	59		21	37		56	16		25	54	8
9		56	58		26	37	26	1	15		30	53	9
10	21	1	58		31	36		6	15		35	53	10
11		6	57		36	35		11	14		40	52	11
12		11	56		41	35		16	13		45	51	12
13		16	55		46	34		21	12		50	50	13
14		21	55		51	34		26	12		55	50	14
15		26	54		56	33		31	11	29	0	49	15
16		31	53	24	1	32		36	10		5	48	16
17		36	53		6	32		41	10		10	48	17
18		41	52		11	31		46	9		15	47	18
19		46	51		16	30		51	8		20	46	19
20		51	50		21	29		56	7		25	45	20
21		56	50		26	29	27	1	7		30	45	21
22	22	1	49		31	28		6	6		35	44	22
23		6	48		36	27		11	5		40	43	23
24		11	47		41	26		16	4		45	42	24
25		16	47		46	26		21	4		50	42	25
26		21	46		51	25		26	3		55	41	26
27		26	45		56	24		31	2	30	0	40	27
28		31	45	25	1	24		36	2		5	40	28
29		36	44		6	23		41	1		10	39	29
30		41	43		11	22		46	0		15	38	30
31					16	22					20	38	31

Tab. VI.

H.	'	''	'	''	H.
M.	''	'''	''	'''	M.
S.	'''	''''	'''	''''	S.
1	0	12	6	27	31
2		25		40	32
3		37		52	33
4		50	7	5	34
5	1	2		17	35
6		15		30	36
7		27		42	37
8		40		55	38
9		52	8	7	39
10	2	5		20	40
11		17		32	41
12		30		44	42
13		42		57	43
14		55	9	9	44
15	3	7		22	45
16		20		34	46
17		32		47	47
18		44		59	48
19		57	10	12	49
20	4	9		24	50
21		22		37	51
22		34		50	52
23		47	11	2	53
24		59		11	54
25	5	12		27	55
26		24		40	56
27		37		52	57
28		50	12	5	58
29	6	2		17	59
30		15		30	60

A TABLE of the Central Equation of Jupiter.

Tab VII.

S.	0 Sub.			1 Sub.			2 Sub.			3 Sub.			4 Sub.			5 Sub.			S.
	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	°	′	″	
0	0	0	0	2	37	29	4	38	22	5	31	0	4	55	40	2	54	48	30
1		5	28		42	17		41	23		31	18		52	55		49	36	29
2		10	55		47	3		44	19		31	30		50	4		44	20	28
3		16	22		51	47		47	10		31	36		47	8		39	0	27
4		21	49		56	28		49	57		31	36		44	6		33	36	26
5		27	16	3	1	6		52	39		31	30		40	59		28	9	25
6		32	42		5	41		55	15		31	18		37	46		22	39	24
7		38	8		10	13		57	46		31	0		34	27		17	6	23
8		43	33		14	42	5	0	12		30	35		31	2		11	30	22
9		48	57		19	9		2	33		30	4		27	32		5	51	21
10		54	21		23	33		4	50		29	27		23	56		0	9	20
11		59	34		27	54		7	1		28	44		20	15	1	54	26	19
12	1	5	5		32	11		9	7		27	55		16	29		48	40	18
13		10	26		36	24		11	7		27	0		12	37		42	51	17
14		15	46		40	34		13	2		25	58		8	40		37	0	16
15		21	4		44	40		14	52		24	50		4	38		31	6	15
16		26	21		48	43		16	36		23	36		0	32		25	10	14
17		31	37		52	42		18	15		22	16	3	56	21		19	12	13
18		36	52		56	37		19	48		20	50		52	4		13	13	12
19		42	5	4	0	28		21	15		19	17		47	42		7	13	11
20		47	17		4	16		22	37		17	39		43	15		1	11	10
21		52	27		8	0		23	54		15	55		38	44	0	55	8	9
22		57	35		11	40		25	5		14	5		34	9		49	3	8
23	2	2	41		15	15		26	10		12	8		29	29		42	58	7
24		7	45		18	46		27	10		10	4		24	44		36	52	6
25		12	47		22	13		28	4		7	54		19	55		30	45	5
26		17	48		25	36		28	51		5	39		15	2		24	37	4
27		22	47		28	54		29	32		3	18		10	5		18	28	3
28		27	44		32	8		30	7		0	32		5	3		12	19	2
29		32	38		35	17		36	36	4	58	19	2	59	57		6	10	1
30		37	29		38	22		31	0		55	40		54	48	0	0	0	0
S.	11 Add.			10 Add.			9 Add.			8 Add.			7 Add.			6 Add.			S.

A TABLE of the Sun's Place for the Year 1742.

Tab. VIII.

Days.	Jan.		Feb.		March		April		May		June		July		August		Sept.		Octob.		Nov.		Dec.		Days.
	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	°	'	
1	22	14	23	41	21	47	22	22	21	29	21	11	19	47	19	27	19	27	18	57	19	59	20	24	1
2	23	15	24	43	22	47	23	21	22	27	22	8	20	44	20	24	20	25	19	57	20	59	21	25	2
3	24	16	25	43	23	46	24	19	23	24	23	5	21	42	21	22	21	24	20	56	22	0	22	26	3
4	25	17	26	44	24	46	25	18	24	22	24	3	22	39	22	20	22	22	21	56	23	0	23	27	4
5	26	19	27	45	25	46	26	17	25	30	25	0	23	36	23	18	23	21	22	56	24	1	24	28	5
6	27	20	28	45	26	45	27	15	26	17	25	57	24	33	24	15	24	20	23	55	25	1	25	29	6
7	28	21	29	45	27	45	28	14	27	15	26	55	25	31	25	13	25	18	24	55	26	2	26	30	7
8	29	22	♓	45	28	44	29	12	28	13	27	52	26	28	26	11	26	17	25	55	27	3	27	31	8
9	♒	23	1	46	29	44	♉	11	29	10	28	49	27	25	27	9	27	16	26	55	28	3	28	32	9
10	1	24	2	46	♈	43	1	9	♊	8	29	46	28	22	28	7	28	15	27	55	29	4	29	34	10
11	2	25	3	46	1	43	2	7	1	6	♋	43	29	20	29	5	29	14	28	54	♐	4	♑	35	11
12	3	26	4	47	2	42	3	6	2	3	1	41	♌	17	♍	2	♎	12	29	54	1	5	1	36	12
13	4	27	5	47	3	41	4	4	3	1	2	38	1	14	1	0	1	11	♏	54	2	6	2	37	13
14	5	28	6	47	4	40	5	2	3	58	3	35	2	12	1	58	2	10	1	54	3	7	3	38	14
15	6	29	7	47	5	40	6	0	4	56	4	32	3	9	2	56	3	9	2	54	4	8	4	40	15
16	7	30	8	47	6	39	6	59	5	53	5	29	4	7	3	53	4	8	3	54	5	9	5	41	16
17	8	31	9	48	7	38	7	57	6	51	6	26	5	2	4	52	5	7	4	54	6	10	6	42	17
18	9	32	10	48	8	37	8	55	7	48	7	24	5	51	5	51	6	6	5	54	7	11	7	43	18
19	10	33	11	48	9	37	9	53	8	46	8	21	6	59	6	49	7	5	6	54	8	11	8	44	19
20	11	33	12	48	10	36	10	51	9	43	9	18	7	56	7	47	8	5	7	55	9	12	9	45	20
21	12	34	13	48	11	35	11	49	10	40	10	15	8	53	8	45	9	4	8	55	10	13	10	46	21
22	13	35	14	48	12	34	12	48	11	38	11	12	9	51	9	43	10	3	9	55	11	14	11	48	22
23	14	36	15	48	13	33	13	46	12	35	12	10	10	49	10	41	11	2	10	55	12	15	12	49	23
24	15	37	16	48	14	32	14	44	13	33	13	7	11	46	11	40	12	1	11	55	13	16	13	50	24
25	16	37	17	48	15	31	15	42	14	30	14	4	12	43	12	38	13	1	12	56	14	17	14	51	25
26	17	38	18	48	16	30	16	39	15	27	15	1	13	41	13	36	14	0	13	56	15	18	15	52	26
27	18	39	19	48	17	28	17	37	16	25	15	58	14	39	14	35	15	0	14	56	16	19	16	54	27
28	19	39	20	47	18	27	18	35	17	22	16	56	15	36	15	33	15	59	15	57	17	20	17	55	28
29	20	40			19	26	19	33	18	19	17	53	16	33	16	31	16	58	16	57	18	21	18	56	29
30	21	41			20	28	20	31	19	17	18	50	17	31	17	30	17	58	17	58	19	22	19	57	30
31	22	42			21	23			20	14			18	29	18	28			18	58			20	58	31

A TABLE of Equation of Days. For the First Year after Leap-year.

Tab. IX.

Days.	Jan.	Feb.	March.	April.	May	June	July	August	Sept.	October	Nov.	Dec.	Days.
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	
	+	+	+	+	—	—	+	+	—	—	—	—	
1	9 3	14 47	10 3	0 46	4 2	0 47	4 58	4 32	3 59	13 30	15 32	5 41	1
2	9 26	14 45	9 46	0 30	4 4	0 35	5 6	4 22	4 20	13 44	15 23	5 12	2
3	9 48	14 43	9 29	0 14	4 5	0 23	5 13	4 11	4 41	13 58	15 13	4 43	3
4	10 9	14 40	9 12	— 2	4 6	0 11	5 20	4 0	5 2	14 11	15 2	4 14	4
5	10 30	14 36	8 54	0 17	4 5	+ 1	5 26	3 49	5 23	14 23	14 51	3 44	5
6	10 50	14 31	8 36	0 31	4 4	0 13	5 31	3 37	5 44	14 35	14 39	3 14	6
7	11 9	14 26	8 18	0 45	4 2	0 26	5 36	3 24	6 5	14 47	14 26	2 44	7
8	11 27	14 20	8 00	0 59	4 0	0 39	5 41	3 11	6 26	14 58	14 12	2 14	8
9	11 45	14 13	7 42	1 13	3 57	0 52	5 45	2 57	6 47	15 8	13 58	1 44	9
10	12 2	14 6	7 24	1 26	3 54	1 5	5 48	2 43	7 8	15 18	13 43	1 14	10
11	12 18	13 58	7 5	1 39	3 51	1 18	5 51	2 28	7 28	15 27	13 26	0 44	11
12	12 34	13 49	6 46	1 51	3 47	1 31	5 53	2 13	7 48	15 35	13 9	0 14	12
13	12 48	13 40	6 27	2 2	3 42	1 44	5 54	1 58	8 9	15 42	12 52	+ 17	13
14	13 2	13 30	6 8	2 13	3 36	1 57	5 55	1 42	8 29	15 48	12 33	0 47	14
15	13 15	13 20	5 49	2 24	3 30	2 9	5 55	1 25	8 49	15 53	12 14	1 17	15
16	13 27	13 9	5 30	2 35	3 23	2 21	5 55	1 8	9 9	15 58	11 54	1 47	16
17	13 38	12 58	5 11	2 45	3 16	2 33	5 54	0 51	9 29	16 2	11 32	2 17	17
18	13 48	12 46	4 52	2 54	3 9	2 45	5 52	0 34	9 49	16 6	11 12	2 47	18
19	13 58	12 34	4 34	3 2	3 1	2 57	5 50	0 16	10 9	16 9	10 50	3 16	19
20	14 7	12 21	4 16	3 10	2 53	3 9	5 48	— 2	10 28	16 11	10 28	3 45	20
21	14 15	12 7	3 58	3 18	2 44	3 21	5 45	0 20	10 45	16 12	10 5	4 14	21
22	14 22	11 53	3 40	3 25	2 35	3 32	5 41	0 38	11 5	16 13	9 40	4 42	22
23	14 28	11 38	3 22	3 32	2 26	3 43	5 36	0 57	11 23	16 12	9 15	5 9	23
24	14 33	11 23	3 4	3 38	2 16	3 54	5 31	1 17	11 41	16 11	8 50	5 36	24
25	14 38	11 8	2 46	3 43	2 6	4 4	5 25	1 37	11 58	16 9	8 24	6 3	25
26	14 42	10 53	2 28	3 47	1 56	4 14	5 19	1 57	12 15	16 7	7 58	6 30	26
27	14 45	10 37	2 10	3 51	1 45	4 24	5 13	2 17	12 31	16 4	7 32	6 57	27
28	14 47	10 20	1 52	3 54	1 34	4 33	5 6	2 37	12 46	15 59	7 5	7 23	28
29	14 48		1 35	3 57	1 23	4 42	4 58	2 58	13 1	15 53	6 38	7 48	29
30	14 49		1 18	4 0	1 51	4 50	4 50	3 19	13 16	15 47	6 10	8 12	30
31	14 48		1 2		0 59		4 41	3 39		15 40		8 35	31

A TABLE of Equation of Days. For the Second Year after Leap-year.

Tab. X.

Days.	Jan.		Feb.		March.		April.		May		June		July		August		Sept.		October		Nov.		Dec.		Days.
	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	'	"	
	+		+		+		+		+		—		+		+		—		—		—		—		
1	8	58	14	49	10	8	0	50	4	2	0	51	4	56	4	34	3	54	13	27	15	34	5	48	1
2	9	21	14	47	9	51	0	34	4	4	0	38	5	4	4	24	4	15	13	41	15	26	5	19	2
3	9	43	14	45	9	34	0	18	4	5	0	26	5	11	4	14	4	36	13	55	15	16	4	50	3
4	10	5	14	42	9	17	0	2	4	5	0	14	5	18	4	3	4	57	14	8	15	4	4	21	4
5	10	26	14	38	9	0	—	13	4	4	0	1	5	24	3	52	5	18	14	20	14	54	3	51	5
6	10	45	14	34	8	42	0	28	4	3	+	12	5	30	3	40	5	39	14	32	14	42	3	21	6
7	11	4	14	28	8	24	0	42	4	2	0	25	5	35	3	27	6	00	14	43	14	30	2	51	7
8	11	22	14	24	8	5	0	56	4	0	0	38	5	40	3	13	6	21	14	53	14	16	2	21	8
9	11	40	14	18	7	47	1	10	3	58	0	51	5	44	2	59	6	42	15	3	14	1	1	51	9
10	11	57	14	9	7	29	1	23	3	56	1	4	5	47	2	45	7	3	15	13	13	46	1	21	10
11	12	14	14	1	7	11	1	36	3	53	1	17	5	49	2	31	7	24	15	22	13	30	0	51	11
12	12	30	13	52	6	52	1	48	3	49	1	30	5	51	2	16	7	44	15	31	13	13	0	21	12
13	12	44	13	43	6	33	2	00	3	44	1	43	5	53	2	2	8	4	15	39	12	55	+	9	13
14	12	58	13	34	6	15	2	11	3	38	1	56	5	54	1	45	8	24	15	45	12	37	0	39	14
15	13	11	13	24	5	56	2	21	3	32	2	8	5	55	1	29	8	44	15	51	12	18	1	9	15
16	13	23	13	14	5	37	2	31	3	25	2	20	5	55	1	12	9	4	15	56	11	59	1	39	16
17	13	35	13	4	5	19	2	41	3	18	2	32	5	54	0	55	9	24	16	0	11	39	2	9	17
18	13	46	12	50	5	1	2	51	3	11	2	44	5	52	0	38	9	44	16	4	11	18	2	38	18
19	13	56	12	37	4	42	3	00	3	4	2	56	5	50	0	20	10	4	16	7	10	56	3	7	19
20	14	6	12	25	4	23	3	8	2	56	3	8	5	48	0	2	10	23	16	9	10	33	3	36	20
21	14	30	12	12	4	4	3	15	2	47	3	19	5	45	—	15	10	42	16	11	10	10	4	5	21
22	14	20	11	58	3	45	3	22	2	38	3	30	5	42	0	33	11	1	16	13	9	46	4	34	22
23	14	26	11	43	3	27	3	29	2	29	3	41	5	38	0	52	11	19	16	12	9	21	5	2	23
24	14	32	11	28	3	9	3	35	2	19	3	52	5	33	1	12	11	37	16	11	8	56	5	29	24
25	14	37	11	13	2	51	3	41	2	9	4	2	5	28	1	32	11	54	16	9	8	30	5	56	25
26	14	41	10	58	2	33	3	46	1	59	4	12	5	22	1	52	12	11	16	6	8	4	6	23	26
27	14	44	10	42	2	15	3	50	1	48	4	22	5	15	2	12	12	27	16	3	7	38	6	50	27
28	14	46	10	25	1	57	3	54	1	37	4	31	5	8	2	32	12	43	15	59	7	11	7	16	28
29	14	48			1	40	3	57	1	28	4	40	5	1	2	53	12	58	15	54	6	44	7	41	29
30	14	49			1	23	4	00	1	14	4	48	4	53	3	14	13	13	15	48	6	16	8	5	30
31	14	49			1	6			1	3			4	44	3	34			15	41			8	29	31

The Equation of Days for the Third Year after Leap-year.

Tab. XI.

Days.	Jan.		Feb.		March		April		May		June		July		August		Sept.		Octob.		Nov.		Dec.		Days.
	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″	′	″	
	+		+		+		+		−		−		+		+		−		−		−		−		
1	8	52	14	49	10	12	0	54	4	5	0	53	4	54	4	36	3	50	13	23	15	36	5	54	1
2	9	15	14	47	9	55	0	38	4	4	0	41	5	2	4	27	4	11	13	38	15	28	5	25	2
3	9	37	14	45	9	38	0	22	4	5	0	38	5	9	4	17	4	32	13	52	15	19	4	56	3
4	9	59	14	42	9	21	0	6	4	5	0	16	5	17	4	5	4	53	14	5	15	8	4	27	4
5	10	20	14	38	9	4	−	9	4	4	0	4	5	23	3	53	5	14	14	18	14	57	3	58	5
6	10	41	14	34	8	46	0	24	4	3	+	9	5	29	3	41	5	35	14	30	14	45	3	29	6
7	11	00	14	29	8	28	0	38	4	2	0	22	5	35	3	29	5	55	14	41	14	32	2	59	7
8	11	18	14	24	8	10	0	52	4	0	0	35	5	39	3	16	6	16	14	52	14	19	2	29	8
9	11	36	14	18	7	52	1	6	3	58	0	48	5	43	3	3	6	37	15	2	14	5	1	59	9
10	11	53	14	11	7	34	1	19	3	56	1	1	5	46	2	49	6	58	15	12	13	50	1	29	10
11	12	10	14	3	7	15	1	32	3	53	1	13	5	49	2	34	7	19	15	21	13	34	0	59	11
12	12	26	13	54	6	56	1	45	3	49	1	26	5	51	2	19	7	40	15	29	13	17	0	29	12
13	12	41	13	45	6	38	1	57	3	45	1	39	5	53	2	4	8	00	15	37	13	0	+	1	13
14	12	55	13	36	6	19	2	9	3	40	1	52	5	54	1	48	8	20	15	44	12	42	0	31	14
15	13	8	13	26	6	00	2	20	3	34	2	5	5	55	1	32	8	40	15	50	12	23	1	2	15
16	13	21	13	15	5	41	2	30	3	27	2	17	5	55	1	16	9	00	15	55	12	4	1	32	16
17	13	32	13	4	5	23	2	40	3	20	2	29	5	54	0	59	9	20	16	00	11	44	2	2	17
18	13	43	12	53	5	5	2	49	3	13	2	41	5	53	0	42	9	40	16	4	11	23	2	32	18
19	13	53	12	41	4	46	2	58	3	6	2	53	5	51	0	25	9	59	16	7	11	1	3	1	19
20	14	2	12	28	4	27	3	7	2	58	3	5	5	49	0	8	10	18	16	9	10	38	3	30	20
21	14	10	12	15	4	8	3	15	2	50	3	17	5	46	−	10	10	37	16	11	10	15	3	59	21
22	14	18	12	1	3	50	3	22	2	41	3	28	5	43	0	29	10	56	16	12	9	51	4	28	22
23	14	25	11	47	3	32	3	29	2	32	3	39	5	39	0	48	11	18	16	12	9	27	4	56	23
24	14	31	11	32	3	14	3	35	2	22	3	50	5	34	1	7	11	31	16	11	9	2	5	23	24
25	14	36	11	17	2	56	3	40	2	12	4	00	5	28	1	27	11	49	16	9	8	36	5	50	25
26	14	40	11	1	2	37	3	45	2	2	4	11	5	22	1	48	12	6	16	7	8	10	6	17	26
27	14	43	10	45	2	19	3	49	1	51	4	21	5	15	2	8	12	22	16	4	7	44	6	43	27
28	14	45	10	29	2	1	3	53	1	40	4	30	5	8	2	28	12	38	16	0	7	17	7	9	28
29	14	47			1	44	3	57	1	29	4	39	5	1	2	48	12	53	15	55	6	50	7	34	29
30	14	48			1	27	4	00	1	17	4	47	4	53	3	9	13	8	15	49	6	22	7	59	30
31	14	49			1	11			1	5			4	45	3	29			15	43			8	23	31

The Equation of Days for the Leap-year.

Tab. XII.

Days.	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Days.
	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	
	+	+	+	+	−	−	+	+	−	−	−	−	
1	8 46	14 49	10 1	0 42	4 4	0 46	4 59	4 30	4 4	13 34	15 30	5 34	1
2	9 9	14 48	9 44	0 26	4 5	0 34	5 7	4 20	4 25	13 48	15 21	5 5	2
3	9 34	14 46	9 27	0 10	4 6	0 22	5 14	4 9	4 45	14 1	15 11	5 36	3
4	9 54	14 44	9 12	— 5	4 6	0 11	5 20	3 58	5 6	14 14	15 0	4 6	4
5	10 15	14 41	8 52	0 20	4 5	+ 3	5 26	3 47	5 27	14 26	14 48	3 36	5
6	10 36	14 37	8 34	0 35	4 4	0 16	5 31	3 35	5 48	14 38	14 36	3 6	6
7	10 56	14 32	8 16	0 49	4 2	0 29	5 36	3 22	6 9	14 49	14 23	2 36	7
8	11 15	14 27	7 58	1 3	4 0	0 42	5 41	3 8	6 30	14 59	14 9	2 6	8
9	11 33	14 21	7 40	1 16	3 57	0 55	5 45	2 54	6 51	15 9	13 54	1 36	9
10	11 50	14 14	7 21	1 29	3 54	1 7	5 48	2 40	7 12	15 19	13 39	1 6	10
11	12 7	14 6	7 2	1 42	3 50	1 20	5 51	2 26	7 33	15 28	13 23	0 36	11
12	12 23	13 57	6 43	1 54	3 45	1 33	5 54	2 11	7 54	15 36	13 6	0 6	12
13	12 38	13 48	6 24	2 6	3 40	1 46	5 56	1 55	8 14	15 43	12 48	+ 24	13
14	12 52	13 39	6 5	2 17	3 35	1 59	5 57	1 39	8 34	15 49	12 29	0 54	14
15	13 6	13 29	5 46	2 27	3 29	2 11	5 57	1 23	8 54	15 55	12 9	1 24	15
16	13 19	13 19	5 27	2 37	3 22	2 23	5 56	1 6	9 14	16 00	11 49	1 53	16
17	13 31	13 8	5 8	2 46	3 16	2 35	5 55	0 49	9 34	16 4	11 28	2 22	17
18	13 42	12 57	4 49	2 55	3 9	2 47	5 53	0 31	9 54	16 7	11 7	2 51	18
19	13 52	12 45	4 30	3 3	3 1	2 59	5 51	0 13	10 14	16 9	10 45	3 20	19
20	14 1	12 33	4 12	3 11	2 52	3 11	5 48	— 5	10 33	16 10	10 22	3 49	20
21	14 10	12 20	3 54	3 19	2 43	3 23	5 45	0 23	10 51	16 11	9 58	4 18	21
22	14 18	12 6	3 36	3 26	2 34	3 34	5 41	0 41	11 9	16 12	9 34	4 46	22
23	14 25	11 52	3 18	3 33	2 25	3 45	5 36	1 00	11 27	16 12	9 9	5 14	23
24	14 31	11 37	3 00	3 39	2 15	3 56	5 31	1 20	11 44	16 11	8 43	5 41	24
25	14 36	11 22	2 42	3 44	2 5	4 6	5 25	1 40	12 1	16 9	8 17	6 8	25
26	14 40	11 7	2 24	3 48	1 54	4 16	5 19	2 0	12 18	16 6	7 51	6 35	26
27	14 44	10 51	2 6	3 52	1 43	4 25	5 13	2 20	12 34	16 2	7 25	7 2	27
28	14 47	10 35	1 48	3 56	1 32	4 34	5 6	2 40	12 50	15 57	6 58	7 28	28
29	14 49	10 18	1 31	3 59	1 21	4 43	4 58	3 1	13 5	15 51	6 30	7 53	29
30	14 50		1 14	4 2	1 10	4 51	4 49	3 22	13 20	15 45	6 2	8 17	30
31	14 50		0 58		0 58		4 40	3 43		15 38		8 40	31

Mean Motions of Jupiter's Satellites.

Tab. XIII.

Common Years.	1 S.	1 °	1 '	1 ''	2 S.	2 °	2 '	2 ''	3 S.	3 °	3 '	3 ''	4 S.	4 °	4 '	4 ''
1	3	23	28	46	9	11	47	56	0	5	56	10	10	13	27	22
2	7	16	57	32	6	23	35	52	0	11	52	20	8	26	54	44
3	11	10	26	18	4	5	23	48	0	17	48	30	7	10	22	6
4	9	27	24	24	4	28	34	13	2	14	3	43	6	15	23	44
5	1	20	53	10	2	10	22	19	2	19	59	53	4	28	51	6
6	5	14	21	56	11	22	10	5	2	25	56	03	3	12	18	28
7	9	7	50	42	9	3	58	1	3	1	52	13	1	25	45	50
8	7	24	48	48	9	27	8	26	4	28	07	26	1	0	47	28
9	11	18	17	34	7	8	56	22	5	4	3	36	11	14	14	50
10	3	11	46	20	4	20	44	18	5	9	59	46	9	27	42	12
11	7	5	15	6	2	2	32	14	5	15	55	56	8	11	9	34
12	5	22	13	12	2	25	42	39	7	12	11	9	7	16	11	12
13	9	15	41	58	0	7	30	35	7	18	7	19	5	29	38	34
14	1	9	10	44	9	19	18	31	7	24	3	29	4	13	5	56
15	5	2	39	30	7	1	06	27	7	29	59	39	2	26	33	18
16	3	19	37	36	7	24	16	52	9	26	14	52	2	1	34	56
17	7	13	6	22	5	6	4	48	10	2	11	2	0	15	2	18
18	11	6	35	8	2	17	52	44	10	8	7	12	10	28	29	40
19	3	0	3	54	11	29	40	40	10	14	3	22	9	11	57	2
20	1	17	2	0	0	22	51	5	0	10	18	35	8	16	58	40
40	3	4	4	0	1	15	42	10	0	20	37	10	5	3	57	20
60	4	21	6	0	2	8	33	15	1	0	55	45	1	20	56	00
80	6	8	8	0	3	01	24	20	1	10	14	20	10	7	54	40
100	7	25	10	0	3	24	15	25	1	21	32	55	6	24	53	20
200	3	20	20	00	7	18	30	50	3	13	05	50	1	19	46	40
400	7	10	40	00	3	7	1	40	6	26	11	40	3	9	33	20
600	11	01	00	00	10	25	32	30	10	9	17	30	4	29	20	00
800	2	21	20	00	6	14	3	20	1	22	23	20	6	19	6	40
1000	6	11	40	00	2	2	34	10	5	5	29	10	8	8	53	20

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XIV.

Years of Christ.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″
1701	8	25	44	13	1	0	22	27	0	2	45	42	1	28	7	27
2	0	19	12	59	10	12	10	23	0	8	41	52	0	11	34	49
3	4	12	41	45	7	23	58	19	0	14	38	2	10	25	2	11
4	8	6	10	31	4	5	46	15	0	20	34	12	9	8	29	33
5	6	23	8	37	5	28	56	40	2	16	49	25	8	13	31	11
6	10	16	37	23	3	10	44	36	2	22	45	35	6	26	58	33
7	2	10	6	9	0	22	32	32	2	28	41	45	5	10	25	55
8	6	3	34	55	10	4	20	28	3	4	37	55	3	23	53	17
9	4	20	33	1	10	27	30	53	5	0	53	8	2	28	54	55
10	8	14	1	47	8	9	18	49	5	6	49	18	1	12	22	17
11	0	7	30	33	5	21	6	45	5	12	45	28	11	25	49	39
12	4	0	59	19	3	2	54	41	5	18	41	38	10	9	17	1
13	2	17	57	25	3	26	5	6	7	14	56	51	9	14	18	39
14	6	11	26	11	1	7	53	2	7	20	53	1	7	27	46	1
15	10	4	54	57	10	19	40	58	7	26	49	11	6	11	13	23
16	1	28	23	43	8	1	28	54	8	2	45	21	4	24	40	45
17	3	15	52	49	8	24	39	19	9	29	0	34	3	29	42	23
18	4	8	50	35	6	6	27	15	10	4	56	44	2	13	9	45
19	8	2	19	21	3	18	15	11	10	10	52	54	0	26	37	7
20	11	25	48	7	1	0	3	7	10	16	49	4	11	10	4	29
21	10	12	46	13	1	23	13	32	0	13	4	17	10	15	6	7
22	2	6	14	59	11	5	1	28	0	19	0	27	8	28	33	29
23	5	29	43	45	8	16	49	24	0	24	56	37	7	12	0	51
24	9	23	12	31	5	28	37	20	1	00	52	47	5	25	28	13
25	8	10	10	37	6	21	47	45	2	27	8	0	5	0	29	51
26	0	3	39	23	4	3	35	41	3	3	4	10	3	13	57	13
27	3	27	8	9	1	15	23	37	3	9	0	20	1	27	24	35
28	7	20	36	55	10	27	11	33	3	14	56	30	0	10	51	57
29	6	7	35	1	11	20	21	58	5	11	11	43	11	15	53	35
30	10	1	3	47	9	2	9	54	5	17	7	53	9	29	20	57
31	1	24	32	33	6	13	57	50	5	23	4	3	8	12	48	19
32	5	18	1	19	3	25	45	46	5	29	0	13	6	26	15	41
33	4	4	59	25	4	18	56	11	7	25	15	26	6	1	17	19
34	7	28	28	11	2	00	44	7	8	1	11	36	4	15	44	41
35	11	21	56	57	11	12	32	3	8	7	7	46	2	28	12	3

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XV.

Years of Christ.	1				2				3				4			
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″
1736	3	15	25	43	8	24	19	59	8	13	3	56	1	11	39	25
37	2	2	23	49	9	17	30	24	10	9	19	9	0	16	41	3
38	5	25	52	35	6	29	18	20	10	15	15	19	11	0	8	25
39	8	19	21	21	4	11	6	16	10	21	11	29	9	13	35	47
40	0	12	50	7	1	22	54	12	10	27	7	39	7	27	3	9
41	11	29	48	13	2	16	4	37	0	23	22	52	7	2	4	47
42	3	23	16	59	11	27	52	33	0	29	19	2	5	15	32	9
43	7	16	45	45	9	9	40	29	1	5	15	12	3	28	59	31
44	11	10	14	31	6	21	28	25	1	11	11	22	2	12	26	53
45	9	27	12	37	7	14	38	50	3	7	26	35	1	17	28	31
46	1	20	41	23	4	26	26	46	3	13	22	45	0	0	55	53
47	5	14	10	9	2	8	14	42	3	19	18	55	10	14	23	15
48	9	07	38	55	11	20	2	38	3	25	15	5	8	27	50	37
49	7	24	37	1	0	13	13	3	5	21	30	18	8	2	52	15
50	11	18	5	47	9	25	0	59	5	27	26	28	6	16	19	37
51	3	11	34	33	7	6	48	55	6	3	22	38	4	29	46	59
52	7	5	3	19	4	18	36	51	6	9	18	48	3	13	14	21
53	5	22	1	25	5	11	47	16	8	5	34	1	2	18	15	59
54	9	15	30	11	2	23	35	12	8	11	30	11	1	1	43	21
55	1	8	58	57	0	5	23	8	8	17	26	21	11	15	10	43
56	5	2	27	43	9	17	11	4	8	23	22	31	9	28	38	5
57	3	19	25	49	10	10	21	29	10	19	37	44	9	3	39	43
58	7	12	54	35	7	22	9	25	10	25	33	52	7	17	7	5
59	11	6	23	21	5	3	57	21	11	1	30	4	6	0	34	27
60	2	29	52	7	2	15	45	17	11	7	26	14	4	13	51	49
61	1	16	50	13	3	8	55	42	1	3	41	27	3	19	3	27
62	5	10	18	59	0	20	43	38	1	9	37	37	2	2	30	49
63	9	3	47	45	10	2	31	34	1	15	33	47	0	15	58	11
64	0	27	16	31	7	14	19	30	1	21	29	57	11	29	25	33
65	11	14	14	37	8	7	29	55	3	17	45	10	10	4	27	11
66	3	7	43	23	5	19	17	51	3	23	41	20	8	17	54	33
67	7	1	12	9	3	1	5	47	3	29	37	30	7	1	21	55
68	10	24	41	55	0	12	53	43	4	5	33	40	5	14	49	17
69	9	11	39	1	1	6	4	8	6	1	48	53	4	19	50	55
70	1	5	7	47	10	17	52	4	6	7	45	3	3	3	18	17

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XVI.

Years of Christ	1				2				3				4			
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″
1771	4	28	36	33	7	29	40	0	6	13	41	13	1	16	45	39
72	8	22	5	19	5	11	27	56	6	19	37	23	0	0	13	1
73	7	9	3	25	6	4	38	21	8	15	52	36	11	5	14	39
74	11	2	32	11	3	16	26	17	8	21	48	46	9	18	42	1
75	2	26	0	57	0	28	14	13	8	27	44	56	8	2	9	23
76	6	19	29	43	10	10	2	9	9	3	41	6	6	15	36	45
77	5	6	27	49	11	3	12	34	10	29	56	19	5	20	38	23
78	8	29	56	35	8	15	0	30	11	5	52	29	4	4	5	45
79	0	23	25	21	5	26	48	26	11	11	48	39	2	17	33	7
80	4	16	54	7	3	8	36	22	11	17	44	49	1	1	0	29
81	3	3	52	13	4	1	46	47	1	14	0	2	0	6	2	7
82	6	27	20	59	1	13	34	43	1	19	56	12	10	19	29	29
83	10	20	49	45	10	25	22	39	1	25	52	22	9	2	16	51
84	2	14	18	31	8	7	10	35	2	1	48	32	7	16	24	13
85	1	1	16	37	9	0	21	00	3	28	3	45	6	21	25	51
86	4	24	45	23	6	12	8	56	4	3	59	55	5	4	53	13
87	8	18	14	9	3	23	56	52	4	9	56	5	3	18	20	35
88	0	11	42	55	1	5	44	48	4	15	52	15	2	1	47	57
89	10	28	41	01	1	28	55	13	6	12	7	28	1	6	49	35
90	2	22	9	47	11	10	43	9	6	18	3	38	1	20	16	57
91	6	15	38	33	8	22	31	5	6	23	59	48	10	3	44	19
92	10	9	7	19	6	4	19	1	6	29	55	58	8	17	11	41
93	8	26	5	25	6	27	29	26	8	26	11	11	7	22	13	19
94	0	19	34	11	4	9	17	22	9	2	7	21	6	5	40	41
95	4	13	2	57	1	21	5	18	9	8	3	31	4	19	8	3
96	8	6	31	43	11	2	53	14	9	13	59	41	3	2	35.	25
97	6	23	29	49	11	26	3	39	11	10	14	54	2	7	37	3
98	10	16	58	35	9	7	51	35	11	16	11	4	0	21	4	25
99	2	10	27	21	6	19	39	31	11	22	7	14	11	4	31	47
1800	6	3	56	7	4	1	27	27	11	28	3	24	9	17	59	9
1	4	20	54	13	4	24	37	52	1	24	18	37	8	23	0	47
2	8	14	22	59	2	6	25	48	2	0	14	47	7	6	28	9
3	0	7	51	45	11	18	13	44	2	6	10	57	5	19	55	31
4	4	1	20	31	9	0	1	40	2	12	7	7	4	3	22	53
5	2	18	18	37	9	23	12	5	4	8	22	20	3	8	24	31

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XVII.

Years of Christ	1				2				3				4			
	S.	°	'	"	S.	°	'	"	S.	°	'	"	S.	°	'	"
1701	8	24	30	2	0	29	45	30	0	2	27	22	1	27	59	36
02	0	17	58	48	10	11	33	24	0	8	23	32	0	11	26	58
03	4	11	27	34	7	23	21	20	0	14	19	42	10	24	54	20
04	8	4	56	20	5	5	9	16	0	20	15	52	9	8	21	42
05	6	21	54	26	5	28	19	43	2	16	31	5	8	13	23	20
06	10	15	23	12	3	10	7	39	2	22	27	15	6	26	50	42
07	2	8	51	58	0	21	55	35	2	28	23	25	5	10	18	4
08	6	2	20	44	10	3	43	21	3	4	19	35	3	23	45	26
09	4	19	18	50	10	26	53	56	5	0	34	48	2	28	47	4
10	8	13	47	36	8	08	41	52	5	6	30	58	1	12	14	26
11	0	6	16	22	5	20	29	48	5	12	27	8	11	25	41	48
12	3	29	45	8	3	2	17	44	5	18	23	18	10	9	9	10
13	2	16	43	14	3	25	28	9	7	14	38	31	9	14	10	48
14	6	10	12	0	1	7	16	5	7	20	34	41	7	27	38	10
15	10	3	40	46	10	19	4	1	7	26	30	51	6	11	5	32
16	1	27	9	32	8	0	51	57	8	2	27	1	4	24	32	54
17	0	14	07	38	8	24	2	23	9	28	42	14	3	29	34	32
18	4	7	36	24	6	5	50	18	10	4	38	24	2	13	1	54
19	8	1	5	10	3	17	38	14	10	10	34	34	0	26	29	16
20	11	24	33	56	0	29	26	10	10	16	30	44	11	9	56	38
21	10	11	32	2	1	22	36	35	0	12	45	57	10	14	58	16
22	2	5	0	48	11	4	24	31	0	18	42	7	8	28	25	38
23	5	28	29	34	8	16	12	27	0	24	38	17	7	11	53	0
24	9	21	58	20	5	28	0	23	1	0	34	27	5	25	20	22
25	8	8	56	26	6	21	10	48	2	26	49	40	5	0	22	0
26	0	2	25	12	4	2	58	44	3	2	45	50	3	13	49	22
27	3	25	53	58	1	14	46	40	3	8	42	0	1	27	16	44
28	7	19	22	44	10	26	34	36	3	14	38	10	0	10	44	6
29	6	6	20	50	11	19	45	1	5	10	53	23	11	15	45	44
30	9	29	49	36	9	1	32	57	5	16	49	33	9	29	13	6
31	1	23	18	22	6	13	20	53	5	22	45	43	8	12	40	28
32	5	16	47	8	3	25	08	49	5	28	41	53	6	26	7	50
33	4	3	45	15	4	18	19	14	7	14	57	6	6	1	9	28
34	7	27	14	00	2	0	7	10	8	0	53	16	4	14	36	50
35	11	20	42	46	11	11	55	6	8	6	49	26	2	28	4	12

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XVIII.

Years of Christ	1				2				3				4			
	S.	°	'	"	S.	°	'	"	S.	°	'	"	S.	°	'	"
1736	3	14	11	32	8	23	47	2	8	12	45	36	1	11	31	34
37	2	1	9	38	9	16	53	27	10	9	0	49	0	16	33	12
38	5	24	38	24	6	28	41	23	10	14	56	59	11	0	00	34
39	9	18	7	10	4	10	29	19	10	20	53	9	9	13	27	56
40	1	11	35	56	1	22	17	15	10	26	49	19	7	26	55	18
41	11	28	34	2	2	15	27	40	0	23	4	32	7	1	56	56
42	3	22	2	48	11	27	15	36	0	29	0	42	5	15	24	18
43	7	15	31	34	9	9	3	32	1	4	56	52	3	28	51	40
44	11	9	0	20	6	20	51	28	1	10	53	2	2	12	19	2
45	9	25	58	26	7	14	1	53	3	7	8	15	1	17	20	40
46	1	19	27	12	4	25	49	49	3	13	4	25	0	0	48	2
47	5	12	55	58	2	7	37	45	3	19	0	35	10	14	15	24
48	9	06	24	44	11	19	25	41	3	24	56	45	8	27	32	46
49	7	23	22	50	0	12	36	6	5	21	11	58	8	2	44	24
50	11	16	51	36	9	24	24	4	5	27	8	8	6	16	11	46
51	3	10	20	22	7	6	11	58	6	3	4	18	4	29	39	8
52	7	3	49	8	4	17	59	54	6	9	0	28	3	13	6	30
53	5	20	47	14	5	11	10	19	8	5	15	41	2	18	8	8
54	9	14	16	0	2	22	58	15	8	11	11	51	1	1	35	30
55	1	7	44	46	0	4	46	11	8	17	8	1	11	15	2	52
56	5	1	13	32	9	16	34	7	8	23	4	11	9	28	30	14
57	3	18	11	38	10	9	44	32	10	19	19	24	9	3	31	52
58	7	11	40	24	7	21	32	28	10	25	15	34	7	16	59	14
59	11	5	9	10	5	3	20	24	11	1	11	44	6	0	26	36
60	2	28	37	56	2	15	08	20	11	7	7	54	4	13	53	58
61	1	15	36	2	3	8	18	45	1	3	23	7	3	18	55	36
62	5	9	4	48	0	20	6	41	1	9	19	17	2	2	22	58
63	9	2	33	34	10	1	54	37	1	15	15	27	0	15	50	20
64	0	26	2	20	7	13	42	33	1	21	11	37	10	29	17	42
65	11	13	0	26	8	6	52	58	3	17	26	50	10	4	19	20
66	3	6	29	12	5	18	40	54	3	23	23	00	8	17	46	42
67	6	29	57	48	3	0	28	50	3	29	19	10	7	1	14	4
68	10	23	26	34	0	12	16	46	4	5	15	20	5	14	41	26
69	9	10	24	50	1	5	27	21	6	1	30	33	4	19	43	4
70	1	3	53	36	10	17	15	7	6	7	26	43	3	3	10	26

Roots of the Mean Motions of Jupiter's Satellites.

Tab. XIX.

Years of Christ	1				2				3				4			
	S.	°	'	''	S.	°	'	''	S.	°	'	''	S.	°	'	''
1771	4	27	22	22	7	29	3	3	6	13	22	53	11	16	37	48
72	8	20	51	8	5	10	50	59	6	19	19	3	0	0	5	10
73	7	7	49	14	6	4	1	24	8	15	34	16	11	5	6	48
74	11	1	18	0	3	15	49	20	8	21	30	26	9	18	34	10
75	2	24	46	46	0	27	37	16	8	27	26	36	8	2	11	32
76	6	18	15	32	10	9	25	12	9	3	22	46	6	15	28	54
77	5	5	13	38	11	2	35	37	10	29	37	59	5	20	30	32
78	8	28	42	24	8	14	23	33	11	5	34	9	4	3	57	54
79	0	22	11	10	5	26	11	29	11	11	30	19	2	17	25	16
80	4	15	39	56	3	7	59	25	11	17	26	29	1	0	52	38
81	3	2	38	2	4	1	9	50	11	13	41	42	0	5	54	16
82	6	26	6	48	1	12	57	46	1	19	37	52	10	19	21	38
83	10	19	35	34	10	24	45	42	1	25	34	2	9	2	49	40
84	2	13	4	20	8	6	33	38	2	1	30	12	7	16	16	22
85	1	0	2	26	8	29	44	3	3	27	45	25	6	21	18	0
86	4	23	31	12	6	10	31	59	4	3	41	35	5	4	45	22
87	8	16	59	58	3	22	19	55	4	9	37	45	3	18	12	44
88	0	10	28	44	1	4	7	51	4	15	33	55	2	1	40	6
89	10	27	26	50	1	28	18	16	6	11	49	8	1	6	41	44
90	2	20	55	36	11	10	6	12	6	17	45	18	11	20	9	6
91	6	14	24	22	8	21	54	8	6	13	41	28	10	3	36	28
92	10	7	53	8	6	3	42	4	6	29	37	38	8	17	3	50
93	8	24	51	14	6	26	52	29	8	25	52	51	7	22	5	28
94	0	18	20	0	4	8	40	25	9	1	49	1	6	5	32	50
95	4	11	48	46	1	20	28	21	9	7	45	11	4	19	0	12
96	8	5	17	32	11	2	16	17	9	13	41	21	3	2	27	34
97	6	22	15	38	11	25	26	42	11	9	56	34	2	7	29	12
98	10	15	44	24	9	7	14	38	11	15	52	44	0	20	56	34
99	2	9	13	10	6	19	2	34	11	21	48	54	11	4	23	56
1800	6	2	41	56	4	0	50	30	11	27	45	4	9	17	51	18
1	4	19	40	2	4	24	0	55	1	24	0	17	8	22	52	56
2	8	13	8	48	2	5	48	51	1	29	56	27	7	6	20	18
3	0	6	37	34	11	17	36	47	2	5	52	37	5	19	47	40
4	4	00	6	20	8	29	24	43	2	11	48	47	4	3	15	2
5	2	17	4	26	9	22	35	8	4	8	4	0	3	8	16	40

Mean Motions of Jupiter's Satellites for the Month of January.

Tab. XX.

Days.	1 S.	1 °	1 '	1 "	2 S.	2 °	2 '	2 "	3 S.	3 °	3 '	3 "	4 S.	4 °	4 '	4 "	Days.
1	6	23	29	20	3	21	22	29	1	20	19	3	0	21	34	16	1
2	1	16	58	41	6	22	44	58	3	10	38	7	1	13	8	32	2
3	8	10	28	1	10	4	7	27	5	0	57	10	2	4	42	49	3
4	3	3	57	21	1	15	29	58	6	21	16	14	2	26	17	5	4
5	9	27	26	42	4	26	52	27	8	11	35	17	3	17	51	21	5
6	4	20	56	2	8	8	14	56	10	1	54	20	4	9	25	36	6
7	11	14	25	23	11	19	37	25	11	22	13	24	5	0	59	52	7
8	6	7	54	43	3	0	59	54	1	12	32	28	5	22	34	9	8
9	1	1	24	4	6	12	22	23	3	2	51	31	6	14	8	25	9
10	7	24	53	24	9	23	44	52	4	23	10	35	7	5	42	41	10
11	2	18	22	44	1	5	7	22	6	13	29	38	7	27	16	54	11
12	9	11	52	4	4	16	29	51	8	3	48	42	8	18	51	13	12
13	4	5	21	24	7	27	52	21	9	24	7	45	9	10	25	29	13
14	10	28	50	45	11	9	14	50	11	14	26	49	10	1	59	45	14
15	5	22	20	5	3	20	37	19	1	4	45	52	10	23	34	1	15
16	0	15	49	25	6	1	59	48	2	25	4	56	11	15	8	16	16
17	7	9	18	46	9	13	22	18	4	15	23	59	0	6	42	33	17
18	2	2	48	6	0	24	44	47	6	5	43	3	0	28	16	49	18
19	8	26	17	26	4	6	7	16	7	26	2	6	1	19	51	5	19
20	3	19	46	47	7	17	29	45	9	16	21	10	2	11	25	21	20
21	10	13	16	7	10	28	52	15	11	6	40	13	3	2	59	37	21
22	5	6	45	28	2	10	14	44	10	26	59	17	3	24	33	53	22
23	0	0	14	48	5	21	37	13	2	17	18	20	4	16	8	9	23
24	6	23	44	8	9	2	59	43	4	7	37	23	5	7	42	35	24
25	1	17	13	29	0	14	22	12	5	27	56	27	5	29	16	5	25
26	8	10	42	49	3	25	44	41	7	18	15	30	6	20	50	57	26
27	3	4	12	10	7	7	7	10	9	8	34	34	7	12	25	13	27
28	9	27	41	30	10	18	29	39	10	28	53	37	8	3	59	29	28
29	4	21	10	50	1	29	52	8	0	19	12	41	8	25	33	45	29
30	11	14	40	11	5	11	14	37	2	9	31	44	9	17	8	2	30
31	6	8	9	31	8	22	37	7	3	29	50	48	10	8	42	18	31

Mean Motions of Jupiter's Satellites for the Month of February.

Tab. XXI.

Days.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Days.
1	1	1	38	52	0	3	59	36	5	20	9	51	11	0	16	33	1
2	7	25	8	12	3	15	22	6	7	10	28	55	11	21	50	49	2
3	2	18	37	32	6	26	44	35	9	0	47	58	0	13	25	5	3
4	9	12	6	52	10	8	7	4	10	21	7	2	1	4	59	22	4
5	4	5	36	12	1	19	29	33	0	11	26	5	1	26	33	38	5
6	10	29	5	32	5	0	52	3	2	1	45	9	2	18	7	53	6
7	5	22	34	52	8	12	14	32	3	22	4	12	3	9	42	9	7
8	0	16	4	12	11	23	37	1	5	12	23	16	4	1	16	26	8
9	7	9	33	33	3	4	59	30	7	2	42	19	4	22	50	42	9
10	2	3	2	53	6	16	21	59	8	23	1	23	5	14	24	58	10
11	8	26	32	13	9	27	44	28	10	13	20	26	6	5	59	13	11
12	3	20	1	34	1	9	6	57	0	3	39	30	6	27	33	29	12
13	10	13	30	54	4	20	29	38	1	23	58	33	7	19	7	46	13
14	5	7	0	15	8	1	51	57	3	14	17	37	8	10	42	2	14
15	0	0	29	35	11	13	14	26	5	4	36	40	9	2	16	8	15
16	6	23	58	55	2	24	36	55	6	24	55	44	9	23	50	33	16
17	1	17	28	16	6	5	59	24	8	15	14	47	10	15	24	50	17
18	8	10	57	37	9	17	21	53	10	5	33	50	11	6	59	6	18
19	3	4	26	57	0	28	44	23	11	25	52	54	11	28	33	21	19
20	9	27	56	17	4	10	6	52	1	16	11	57	0	20	7	37	20
21	4	21	25	37	7	21	29	22	3	6	31	1	1	11	41	54	21
22	11	14	54	58	11	2	51	51	4	26	50	4	2	3	16	9	22
23	6	8	24	18	2	14	14	20	6	17	9	8	2	24	50	15	23
24	1	1	53	39	5	25	36	49	8	7	28	11	3	16	24	40	24
25	7	25	22	59	9	6	59	18	9	27	47	15	4	7	58	56	25
26	2	18	52	20	0	18	21	48	11	18	6	18	4	9	33	12	26
27	9	12	21	41	3	29	44	17	1	8	25	22	5	21	7	29	27
28	4	5	51	00	7	11	6	46	2	28	44	25	6	12	41	45	28

Mean Motions of Jupiter's Satellites for the Month of March.

Tab. XXII.

Days.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Days.
1	10	29	20	20	10	22	29	16	4	19	3	29	7	4	16	0	1
2	5	22	49	40	2	3	51	45	6	9	22	32	7	25	50	16	2
3	0	16	19	1	5	15	14	21	7	29	41	36	8	17	24	33	3
4	7	9	48	22	8	26	36	43	9	20	0	39	9	8	58	49	4
5	2	3	17	42	0	7	59	13	11	10	19	43	10	0	33	5	5
6	8	26	47	2	3	19	21	42	1	0	38	46	10	22	7	20	6
7	3	20	16	23	7	0	44	11	2	20	57	50	11	13	41	36	7
8	10	13	45	44	10	12	6	40	4	11	16	53	0	5	15	53	8
9	5	7	15	4	1	23	29	9	6	1	35	57	0	26	50	9	9
10	0	0	45	24	5	4	51	38	7	21	55	0	1	18	24	24	10
11	6	24	13	44	8	16	14	9	9	12	14	4	2	9	58	40	11
12	1	17	43	5	11	27	36	38	11	2	33	7	3	1	32	57	12
13	8	11	12	25	3	8	19	7	0	22	52	10	3	23	7	13	13
14	3	4	41	46	6	20	21	36	2	13	11	14	4	14	41	29	14
15	9	28	11	6	10	1	44	5	4	3	30	17	5	6	15	44	15
16	4	21	40	26	1	13	56	34	5	23	49	21	5	27	50	0	16
17	11	15	9	47	4	24	29	3	7	14	8	24	6	19	24	17	17
18	6	8	39	7	8	5	51	33	9	4	27	28	7	10	58	32	18
19	1	2	8	28	11	17	14	2	10	24	46	31	8	2	32	48	19
20	7	25	37	48	2	28	36	31	0	15	5	35	8	24	7	4	20
21	2	19	7	9	6	9	59	1	2	5	24	38	9	15	41	21	21
22	9	12	36	29	9	21	21	30	3	25	43	42	10	7	15	37	22
23	4	6	5	49	1	2	43	59	5	16	2	45	10	18	49	52	23
24	10	29	35	9	4	14	6	28	7	6	21	49	11	20	23	58	24
25	5	23	4	29	7	25	28	57	8	26	40	52	0	11	58	24	25
26	0	16	33	49	11	6	51	27	10	16	59	56	1	3	32	41	26
27	7	10	3	10	2	18	13	56	0	7	18	59	1	25	6	57	27
28	2	3	32	30	5	29	36	25	1	27	38	3	2	16	41	12	28
29	8	27	1	50	9	10	58	54	3	17	57	6	3	8	15	28	29
30	3	20	31	11	0	22	21	23	5	8	16	10	3	29	49	45	30
31	10	14	0	31	4	3	43	52	6	28	35	13	4	21	24	1	31

Mean Motions of Jupiter's Satellites for the Month of April.

Tab. XXIII.

Days.	1				2				3				4				Days.
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″	
1	5	7	29	52	7	15	6	23	8	18	54	16	5	12	58	16	1
2	0	0	59	12	10	26	28	52	10	9	13	20	6	4	32	32	2
3	6	24	28	32	2	7	51	21	11	29	32	24	6	26	6	48	3
4	1	17	57	53	5	19	13	50	1	19	51	27	7	17	41	5	4
5	8	11	27	14	9	0	36	19	3	10	10	30	8	9	15	21	5
6	3	4	56	34	0	11	58	48	5	0	29	34	9	0	49	36	6
7	9	28	25	54	3	23	21	18	6	20	48	37	9	22	23	52	7
8	4	21	55	15	7	4	43	17	8	11	7	41	10	13	58	8	8
9	11	15	24	35	10	16	6	16	10	1	26	44	11	5	32	25	9
10	6	8	53	55	1	27	28	45	11	21	45	48	11	27	6	41	10
11	1	2	23	16	5	8	51	15	1	12	4	51	0	18	40	56	11
12	7	25	52	36	8	20	13	44	3	2	23	55	1	10	15	12	12
13	2	19	21	56	0	1	36	14	4	22	42	58	2	1	49	39	13
14	9	12	51	17	3	12	58	43	6	13	2	2	2	23	23	45	14
15	4	6	20	37	6	24	21	12	8	3	21	5	3	14	58	1	15
16	10	29	49	58	10	5	43	41	9	23	40	9	4	6	32	16	16
17	5	23	19	18	1	17	6	10	11	13	59	12	4	28	6	32	17
18	0	16	48	38	4	28	28	39	1	4	18	16	5	19	40	49	18
19	7	10	17	58	8	9	51	8	2	24	37	19	6	11	15	5	19
20	2	3	47	18	11	21	13	38	4	14	56	23	7	2	49	21	20
21	8	27	16	38	3	2	36	8	6	5	15	26	7	24	23	36	21
22	3	20	45	59	6	13	58	37	7	25	34	30	8	15	57	53	22
23	10	14	15	20	9	25	21	6	9	15	53	33	9	7	32	9	23
24	5	7	44	40	1	6	43	35	11	6	12	37	9	29	6	25	24
25	0	1	14	1	4	18	6	4	0	26	31	40	10	20	40	41	25
26	6	24	43	21	7	29	28	33	2	16	50	44	11	12	14	56	26
27	1	18	14	41	11	10	51	3	4	7	9	47	0	3	49	13	27
28	8	11	42	1	2	22	13	32	5	27	28	50	0	25	23	29	28
29	3	5	11	22	6	3	36	1	7	17	47	54	1	16	57	45	29
30	9	28	41	42	9	14	58	30	9	8	6	57	2	8	32	1	30

Mean Motions of Jupiter's Satellites for the Month of May.

Tab. XXIV.

Days.	1				2				3				4				Days.
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″	
1	4	22	10	3	0	26	21	0	10	28	26	1	3	0	6	17	1
2	11	15	39	23	4	7	43	29	0	18	45	4	3	21	40	33	2
3	6	9	8	43	7	19	5	59	2	9	4	8	4	13	14	49	3
4	1	2	38	4	11	0	28	28	3	29	23	11	5	4	49	5	4
5	7	26	7	24	2	11	50	57	5	19	42	15	5	26	23	21	5
6	2	19	36	44	5	13	23	26	7	10	1	18	6	17	57	37	6
7	9	13	6	5	9	4	35	55	9	0	20	22	7	9	31	53	7
8	4	6	35	25	0	15	58	34	10	20	39	25	8	1	6	9	8
9	11	0	4	46	3	27	20	53	0	10	58	29	8	22	40	25	9
10	5	23	34	6	7	8	43	23	2	1	17	32	9	14	14	41	10
11	0	17	3	26	10	20	5	54	3	21	36	36	10	5	48	57	11
12	7	10	32	46	2	1	28	22	5	11	55	39	10	27	23	13	12
13	2	4	2	7	5	12	50	51	7	2	14	43	11	18	57	29	13
14	8	27	31	27	8	24	13	20	8	22	33	46	0	10	31	44	14
15	2	21	0	47	0	5	35	49	10	12	52	50	1	2	6	1	15
16	10	14	30	7	3	16	58	18	0	3	11	53	1	23	40	17	16
17	5	7	59	28	6	28	20	48	1	23	30	57	2	15	14	33	17
18	0	1	28	48	10	9	43	16	3	13	50	0	3	6	48	49	18
19	6	24	58	8	1	21	5	46	5	4	9	4	3	28	23	4	19
20	1	18	27	29	5	2	28	15	6	24	28	7	4	19	57	21	20
21	8	11	56	49	8	13	50	44	8	14	47	11	5	11	31	37	21
22	3	5	26	10	11	25	13	14	10	5	6	14	6	3	5	53	22
23	9	28	55	30	3	6	35	44	11	25	25	17	6	24	40	8	23
24	4	22	24	51	6	17	58	13	1	15	44	21	7	16	14	25	24
25	11	15	54	11	9	29	20	42	3	6	3	24	8	7	48	41	25
26	6	9	23	31	1	10	43	11	4	26	22	28	8	29	22	57	26
27	1	2	52	52	4	22	5	40	6	16	41	31	9	20	57	13	27
28	7	26	22	12	8	3	28	9	8	7	0	35	10	12	31	28	28
29	2	19	51	33	11	14	50	38	9	27	19	38	11	4	5	45	29
30	9	13	20	53	2	26	13	8	11	17	38	42	11	25	40	1	30
31	4	6	50	13	6	7	35	37	1	7	57	45	0	17	14	17	31

Mean Motions of Jupiter's Satellites for the Month of June.

Tab. XXV.

Days.	1				2				3				4				Days.
	S.	°	'	''	S.	°	'	''	S.	°	'	''	S.	°	'	''	
1	11	0	19	33	9	18	58	7	2	28	16	49	1	8	48	32	1
2	5	23	48	54	1	0	20	36	4	18	35	52	2	0	22	49	2
3	0	17	18	14	4	11	43	5	6	8	54	56	2	21	57	5	3
4	7	10	47	35	7	23	5	34	7	29	13	59	3	13	31	21	4
5	2	4	16	55	11	4	28	3	9	19	33	3	4	5	5	37	5
6	8	27	46	15	2	15	50	30	11	9	52	6	4	26	39	52	6
7	3	21	15	35	5	27	13	2	1	0	11	10	5	18	14	9	7
8	10	14	44	55	9	8	35	31	2	20	30	13	6	9	48	25	8
9	5	8	14	16	0	19	58	10	4	10	49	17	7	1	22	41	9
10	0	1	43	36	4	1	20	29	6	1	8	20	7	22	56	57	10
11	6	25	12	56	7	12	42	59	7	21	27	24	8	14	31	13	11
12	1	18	42	17	10	24	5	29	9	11	46	27	9	6	5	29	12
13	8	12	11	37	2	5	27	58	11	2	5	31	9	27	39	45	13
14	3	5	40	58	5	16	50	27	0	22	24	34	10	19	14	1	14
15	9	29	10	18	8	28	12	56	2	12	43	37	11	10	48	16	15
16	4	22	39	38	0	9	35	25	4	3	2	41	0	2	22	33	16
17	11	16	8	59	3	20	57	54	5	23	21	44	0	23	56	49	17
18	6	9	38	19	7	2	20	23	7	13	40	48	1	15	31	5	18
19	1	3	7	40	10	13	42	53	9	3	59	51	2	7	5	20	19
20	7	26	37	0	1	25	5	22	10	24	18	55	2	28	39	37	20
21	2	20	6	22	5	6	27	52	0	14	37	58	3	20	13	53	21
22	9	13	35	41	8	17	50	21	2	4	57	2	4	11	48	9	22
23	4	7	5	2	11	29	12	50	3	25	16	5	5	3	22	24	23
24	11	0	34	22	3	10	35	19	5	15	35	9	5	24	56	40	24
25	5	24	3	42	6	21	57	48	7	5	54	12	6	16	30	57	25
26	0	17	33	3	10	3	20	18	8	26	13	16	7	8	5	13	26
27	7	11	2	23	1	14	42	47	10	16	32	19	7	29	39	28	27
28	2	4	31	43	4	26	5	16	0	6	51	23	8	21	13	44	28
29	8	28	1	3	8	7	27	45	1	27	10	26	9	12	48	0	29
30	3	21	30	24	11	18	50	14	3	17	29	30	10	4	22	17	30

Mean Motions of Jupiter's Satellites for the Month of July.

Tab. XXVI.

Days.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Days.
1	10	14	59	44	3	0	12	44	5	7	48	33	10	25	56	32	1
2	5	8	29	5	6	11	35	14	6	28	7	37	11	17	30	48	2
3	0	1	58	25	9	22	57	43	8	18	26	40	0	9	5	4	3
4	6	25	27	45	1	4	20	12	10	8	45	44	1	0	39	21	4
5	1	18	57	5	4	15	42	41	11	29	4	47	1	22	13	37	5
6	8	12	26	26	7	27	5	10	1	19	23	51	2	13	47	52	6
7	3	5	55	46	11	8	27	39	3	9	42	54	3	5	22	8	7
8	9	29	25	6	2	19	50	8	5	0	1	58	3	26	56	24	8
9	4	22	54	27	6	1	12	38	6	20	21	1	4	18	30	41	9
10	11	16	23	47	9	12	35	6	8	10	40	5	5	10	4	57	10
11	6	9	53	18	0	23	57	37	10	0	59	8	6	1	39	13	11
12	1	3	22	28	4	5	20	6	11	21	18	11	6	23	13	28	12
13	7	26	51	48	7	16	42	35	1	11	37	15	7	14	47	45	13
14	2	20	21	9	10	28	5	4	3	1	56	18	8	6	22	1	14
15	9	13	50	29	2	9	27	34	4	22	15	22	8	27	56	17	15
16	4	7	19	49	5	20	50	3	6	12	34	25	9	19	30	32	16
17	11	0	49	10	9	2	12	32	8	2	53	29	10	11	4	48	17
18	5	24	18	30	0	13	35	1	9	23	12	32	11	2	39	4	18
19	0	17	47	51	3	24	57	30	11	13	31	36	11	24	13	21	19
20	7	11	17	11	7	6	19	59	1	3	50	39	0	15	47	37	20
21	2	4	46	31	10	17	42	29	2	24	9	43	1	7	21	52	21
22	8	28	15	52	1	29	4	59	4	14	28	46	1	28	56	9	22
23	3	21	45	12	5	10	27	28	6	4	47	50	2	20	30	25	23
24	10	15	14	32	8	21	49	57	7	25	6	53	3	12	4	41	24
25	5	8	43	52	0	3	12	26	9	15	25	57	4	3	38	57	25
26	0	2	13	12	3	14	34	35	11	5	45	0	4	25	13	12	26
27	6	25	42	33	6	25	57	34	0	26	4	4	5	16	47	29	27
28	1	19	41	53	10	7	19	53	2	16	23	7	6	8	21	45	28
29	8	12	41	13	1	18	42	23	4	6	42	11	6	29	56	1	29
30	3	6	10	34	5	0	4	52	5	27	1	14	7	21	30	17	30
31	9	29	39	54	8	11	27	21	7	17	20	18	8	13	4	34	31

Mean Motions of Jupiter's Satellites for the Month of August.

Tab. XXVII.

Days.	1				2				3				4				Days.
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″	
1	4	23	9	15	11	22	49	41	9	7	39	21	9	4	38	49	1
2	11	16	38	35	3	4	12	10	10	27	58	25	9	26	13	5	2
3	6	10	7	55	6	15	34	49	0	18	17	28	10	17	47	21	3
4	1	3	37	16	9	26	57	19	2	8	36	31	11	9	21	39	4
5	7	27	6	36	1	8	19	48	3	28	55	35	0	0	55	54	5
6	2	20	35	57	4	19	42	17	5	19	14	38	0	22	30	9	6
7	9	14	5	17	8	1	4	46	7	9	33	42	1	14	4	25	7
8	4	7	34	37	11	12	27	15	8	29	52	45	2	5	38	41	8
9	11	1	3	58	2	23	49	44	10	20	11	49	2	27	12	57	9
10	5	24	33	18	6	5	12	13	0	10	30	52	3	18	47	13	10
11	0	18	2	39	9	16	34	35	2	0	49	56	4	10	21	29	11
12	7	11	31	59	0	27	57	13	3	21	8	59	5	1	55	45	12
13	2	5	1	19	4	0	19	42	5	11	28	3	5	23	30	1	13
14	8	28	30	40	7	20	42	11	7	1	47	6	6	15	4	17	14
15	3	22	0	0	11	2	4	40	8	22	6	10	7	6	38	33	15
16	10	15	29	20	2	13	27	9	10	12	25	13	7	28	12	49	16
17	5	8	58	40	5	24	49	38	0	2	44	17	8	19	47	5	17
18	0	2	28	0	9	6	12	8	1	23	3	20	9	11	21	20	18
19	6	25	57	21	0	17	34	38	3	13	22	24	10	2	55	37	19
20	1	19	26	41	3	28	57	7	5	3	41	27	10	24	29	53	20
21	8	12	56	1	7	10	19	37	6	24	0	31	11	16	4	9	21
22	3	6	25	22	10	21	42	6	8	14	19	34	0	7	38	25	22
23	9	29	54	42	2	3	4	34	10	4	38	38	0	29	12	41	23
24	4	23	24	2	5	14	27	4	11	24	57	41	1	20	46	57	24
25	11	16	53	23	8	25	49	33	1	15	16	45	2	12	21	13	25
26	6	10	22	43	0	7	12	2	3	5	35	48	3	3	55	29	26
27	1	3	52	4	3	18	34	31	4	25	54	52	3	25	29	45	27
28	7	27	21	24	6	29	57	0	6	16	13	55	4	17	4	1	28
29	2	20	50	45	10	11	19	29	8	6	32	58	5	8	38	17	29
30	9	14	20	5	1	22	41	58	9	26	52	2	6	0	12	33	30
31	4	7	49	25	5	4	4	28	11	17	11	[illegible]	6	21	46	49	31

Mean Motions of Jupiter's Satellites for the Month of September.

Tab. XXVIII.

Days.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Days.
1	11	1	18	46	8	15	26	58	1	7	30	9	7	13	21	5	1
2	5	24	48	6	11	26	49	27	2	27	49	12	8	4	55	21	2
3	0	18	17	27	3	8	11	56	4	18	8	16	8	26	29	37	3
4	7	11	46	47	6	19	34	25	6	8	27	19	9	18	3	53	4
5	2	5	16	7	10	0	56	54	7	28	46	23	10	9	38	9	5
6	8	28	45	27	1	12	19	23	9	19	5	26	11	1	12	25	6
7	3	22	14	49	4	23	41	53	11	9	24	30	11	22	46	41	7
8	10	15	44	8	8	5	4	21	0	29	43	33	0	14	20	57	8
9	5	9	13	29	11	16	26	51	2	20	2	37	1	5	55	13	9
10	0	2	43	49	2	27	49	20	4	10	21	40	1	27	29	24	10
11	6	26	12	9	6	9	11	50	6	0	40	44	2	19	3	45	11
12	1	19	41	30	9	20	54	19	7	20	59	47	3	10	38	1	12
13	8	13	10	50	4	1	56	49	9	11	18	51	4	2	12	17	13
14	3	6	40	10	4	13	19	18	11	1	37	54	4	23	47	33	14
15	10	0	9	30	7	24	41	47	0	21	56	58	5	15	20	50	15
16	4	23	38	50	11	6	4	16	2	12	16	1	6	6	55	5	16
17	11	17	8	11	2	17	26	45	4	2	35	5	6	28	29	21	17
18	6	10	37	31	5	28	29	14	5	22	54	8	7	20	3	37	18
19	1	4	6	52	9	10	11	43	7	13	13	12	8	11	37	53	19
20	7	27	36	12	0	21	34	13	9	3	32	15	9	3	12	10	20
21	2	21	5	33	4	2	56	43	10	23	51	18	9	24	46	25	21
22	9	14	34	53	7	14	19	12	0	14	10	22	10	16	20	41	22
23	4	8	4	14	10	25	41	41	2	4	29	25	11	7	54	57	23
24	11	1	33	34	2	7	4	10	3	24	48	29	11	29	29	14	24
25	5	25	2	54	5	18	26	37	5	15	7	32	0	21	3	30	25
26	0	18	32	15	8	29	48	59	7	5	26	36	1	12	37	45	26
27	7	12	1	35	0	11	11	38	8	25	45	39	2	4	11	1	27
28	2	5	30	55	3	22	34	7	10	16	4	43	2	25	46	17	28
29	8	29	0	16	7	3	56	36	0	6	23	46	3	17	20	34	29
30	3	22	29	36	10	15	19	5	1	26	42	50	4	8	54	50	30

Mean Motions of Jupiter's Satellites for the Month of October.

Tab. XXIX.

Days.	1				2				3				4				Days.
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″	
1	10	15	58	56	1	26	41	35	3	17	1	53	5	0	29	5	1
2	5	9	28	17	5	8	4	4	5	7	20	57	5	22	3	21	2
3	0	2	57	37	8	19	26	34	6	27	40	0	6	13	37	38	3
4	6	26	26	57	0	0	48	3	8	17	59	4	7	5	11	54	4
5	1	19	56	17	3	12	11	32	10	8	18	7	7	26	46	10	5
6	8	13	25	38	6	23	34	1	11	28	37	11	8	18	20	25	6
7	3	6	54	58	10	4	56	30	1	18	56	14	9	9	54	41	7
8	10	0	24	19	1	16	18	59	3	9	15	18	10	1	28	58	8
9	4	23	53	40	2	27	41	28	4	29	34	21	10	23	3	14	9
10	11	17	23	0	8	9	3	58	6	19	53	25	11	14	37	30	10
11	6	10	52	20	11	20	25	28	8	10	12	28	0	6	11	45	11
12	1	4	21	40	3	1	48	57	10	0	31	32	0	27	46	2	12
13	7	27	51	0	6	13	11	27	11	20	50	35	1	19	20	18	13
14	2	21	20	21	9	24	33	55	1	11	9	39	2	10	54	34	14
15	9	14	49	41	1	5	54	24	3	1	28	42	3	2	27	49	15
16	4	8	19	2	4	17	18	54	4	21	47	45	3	24	3	5	16
17	11	1	48	22	7	28	41	23	6	12	6	49	4	15	37	21	17
18	5	25	17	43	11	10	3	52	8	2	25	52	5	7	11	38	18
19	0	18	47	3	2	21	26	21	9	22	44	56	5	28	45	53	19
20	7	12	16	24	6	2	48	50	11	13	3	59	6	20	20	18	20
21	2	5	45	44	9	14	11	20	1	3	23	3	7	11	54	26	21
22	8	29	15	5	0	25	33	49	2	23	42	6	8	3	28	42	22
23	3	22	44	25	1	6	56	19	4	14	1	10	8	25	2	57	23
24	10	16	13	45	7	18	18	48	6	4	20	13	9	16	37	13	24
25	5	9	43	5	10	29	41	27	7	24	39	17	10	8	11	29	25
26	0	3	12	26	2	11	3	46	9	14	58	20	10	29	45	46	26
27	6	26	41	46	5	22	26	15	11	5	17	24	11	21	20	1	27
28	1	20	11	6	9	3	48	44	0	25	36	27	0	12	54	17	28
29	8	13	40	27	0	15	11	13	2	15	55	31	1	4	29	33	29
30	3	7	9	47	3	26	33	43	4	6	14	34	1	26	1	49	30
31	10	0	39	7	7	7	56	12	5	26	33	38	2	17	37	6	31

Mean Motions of Jupiter's Satellites for the Month of November.

Tab. XXX.

Days.	1				2				3				4				Days.
	S.	°	′	″	S.	°	′	″	S.	°	′	″	S.	°	′	″	
1	4	24	8	27	10	19	18	42	7	16	52	41	3	9	11	21	1
2	11	17	37	48	2	0	41	11	9	7	11	45	4	0	45	37	2
3	6	17	7	8	5	12	3	40	10	27	30	48	4	22	19	53	3
4	1	4	36	29	8	23	26	9	0	17	49	52	5	13	54	10	4
5	7	28	5	49	0	4	48	39	2	8	8	55	6	5	28	26	5
6	2	21	35	9	3	16	11	8	3	28	27	59	6	27	2	41	6
7	9	15	4	30	6	27	33	36	5	18	47	2	7	18	36	57	7
8	4	8	33	50	10	8	56	6	7	9	6	5	8	10	11	13	8
9	11	2	3	11	1	20	18	35	8	29	25	9	9	1	45	30	9
10	5	25	32	31	5	1	41	4	10	19	44	12	9	23	19	46	10
11	0	19	1	51	8	13	3	34	0	10	3	16	10	14	54	1	11
12	7	12	31	12	11	24	26	4	2	0	22	19	11	6	28	17	12
13	2	6	0	32	3	5	48	33	3	20	41	23	11	28	2	34	13
14	8	29	29	52	6	17	11	2	5	11	0	26	0	19	36	50	14
15	3	22	59	13	9	28	33	31	7	1	19	30	1	11	11	6	15
16	10	16	28	33	1	9	56	0	8	21	38	33	2	2	45	21	16
17	5	9	57	54	2	21	18	29	10	11	57	37	2	24	19	37	17
18	0	3	27	14	8	2	40	58	0	2	16	40	3	15	53	54	18
19	6	26	56	34	11	14	3	28	1	22	35	44	4	7	28	10	19
20	1	20	25	54	2	25	25	57	3	12	54	47	4	29	2	26	20
21	8	13	54	14	6	6	48	27	5	3	13	51	5	20	36	41	21
22	3	7	24	35	9	18	10	56	6	23	32	54	6	12	10	58	22
23	10	0	53	55	0	29	33	25	8	13	51	58	7	3	45	14	23
24	4	24	23	15	4	10	55	54	10	4	11	1	7	25	19	30	24
25	11	27	52	36	7	22	18	24	11	24	30	5	8	16	53	46	25
26	6	11	21	56	11	3	40	52	1	14	49	8	9	8	28	1	26
27	1	4	51	16	2	15	3	22	3	5	8	12	10	0	2	18	27
28	7	28	20	37	5	26	25	51	4	25	27	15	10	21	36	34	28
29	2	21	49	57	9	7	48	20	6	15	46	19	11	13	10	50	29
30	9	15	19	18	0	19	10	49	8	6	5	22	0	4	45	6	30

Mean Motions of Jupiter's Satellites for the Month of December.

Tab. XXXI.

Days.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Days.
1	4	8	48	38	4	0	33	19	9	26	24	26	0	26	19	21	1
2	11	2	17	58	7	11	55	49	11	16	48	29	1	17	53	38	2
3	5	25	47	18	10	23	18	18	1	7	2	32	2	9	27	54	3
4	0	19	16	39	2	4	40	47	2	27	21	36	3	1	2	10	4
5	7	12	45	59	5	16	3	16	4	17	40	39	3	22	36	26	5
6	2	6	15	20	8	27	25	45	6	7	59	43	4	14	10	42	6
7	8	29	44	40	0	8	48	14	7	28	18	46	5	5	44	58	7
8	3	23	14	00	3	20	10	44	9	18	37	50	5	27	19	14	8
9	10	16	43	21	7	1	33	13	11	8	56	53	6	18	53	30	9
10	5	10	12	41	10	12	55	42	0	29	15	57	7	10	27	45	10
11	0	3	42	2	1	24	17	12	2	19	35	0	8	2	2	2	11
12	6	27	11	22	5	5	40	41	4	9	54	4	8	23	36	18	12
13	1	20	40	42	8	17	3	9	6	0	13	7	9	15	10	34	13
14	8	14	10	2	11	28	25	39	7	20	32	11	10	6	44	49	14
15	3	7	39	22	3	9	48	8	9	10	51	14	10	28	19	6	15
16	10	1	8	43	6	21	10	38	11	1	10	18	11	19	53	22	16
17	4	24	38	3	10	2	33	8	0	21	29	21	0	11	27	38	17
18	11	18	7	24	1	13	55	36	2	11	48	25	1	3	1	54	18
19	6	11	36	44	4	25	18	5	4	2	7	28	1	24	36	9	19
20	1	5	6	5	8	6	40	34	5	22	26	32	2	16	10	26	20
21	7	28	35	25	11	18	3	4	7	12	45	35	3	7	44	42	21
22	2	22	4	45	2	29	25	34	9	3	4	39	3	29	18	58	22
23	9	15	34	6	6	10	48	3	10	23	23	42	4	20	53	13	23
24	4	9	3	26	9	22	10	32	0	13	42	46	5	12	27	30	24
25	11	2	32	46	1	3	33	1	2	4	1	49	6	4	1	46	25
26	5	26	2	7	4	14	55	30	3	24	20	52	6	25	36	2	26
27	0	19	31	27	7	26	17	59	5	14	39	56	7	17	10	15	27
28	7	13	0	47	11	7	40	29	7	4	58	59	8	8	44	33	28
29	2	6	30	8	2	19	2	58	8	25	18	5	9	0	18	50	29
30	8	29	59	28	6	0	25	27	10	15	37	6	9	21	53	6	30
31	3	23	28	48	9	11	47	56	0	5	56	10	10	13	27	22	31

Mean Motions of Jupiter's Satellites for Hours.

Tab. XXXII.

Hours.	1 S.	1 °	1 ′	1 ″	2 S.	2 °	2 ′	2 ″	3 S.	3 °	3 ′	3 ″	4 S.	4 °	4 ′	4 ″	Hours.
1	0	8	28	43	0	4	13	26	0	2	5	48	0	0	53	56	1
2	0	16	57	27	0	8	26	52	0	4	11	35	0	1	47	51	2
3	0	25	26	10	0	12	40	19	0	6	17	23	0	2	41	47	3
4	1	3	54	53	0	16	53	45	0	8	23	11	0	3	35	43	4
5	1	12	23	36	0	21	7	11	0	10	28	58	0	4	29	38	5
6	1	20	52	20	0	25	20	37	0	12	34	46	0	5	23	54	6
7	1	29	21	3	0	29	34	3	0	14	40	33	0	6	17	30	7
8	2	7	49	46	1	3	47	30	0	16	46	21	0	7	11	25	8
9	2	16	18	30	1	8	0	56	0	18	52	9	0	8	5	21	9
10	2	24	47	13	1	12	14	22	0	20	57	56	0	8	59	17	10
11	3	3	15	56	1	16	27	48	0	23	3	44	0	9	53	13	11
12	3	11	44	40	1	20	41	15	0	25	9	32	0	10	47	8	12
13	3	20	13	24	1	24	54	41	0	27	15	19	0	11	41	4	13
14	3	28	42	7	1	29	8	7	0	29	21	7	0	12	35	0	14
15	4	7	10	51	2	3	21	33	1	1	26	55	0	13	28	55	15
16	4	15	39	34	2	7	34	59	1	3	32	42	0	14	22	51	16
17	4	24	8	17	2	11	48	26	1	5	38	30	0	15	16	47	17
18	5	2	37	1	2	16	1	52	1	7	44	18	0	16	10	42	18
19	5	11	5	44	2	20	15	18	1	9	50	5	0	17	4	38	19
20	5	19	34	28	2	24	28	44	1	11	55	53	0	17	58	34	20
21	5	28	3	11	2	28	42	10	1	14	1	41	0	18	52	29	21
22	6	6	31	54	3	2	55	36	1	16	7	28	0	19	46	25	22
23	6	15	0	38	3	7	9	2	1	18	13	16	0	20	40	21	23
24	6	23	29	21	3	11	22	28	1	20	19	3	0	21	34	16	24

Mean Motions of Jupiter's Satellites.

Tab. XXXIII.

' ''	° '	' ''	'' '''	° '	' ''	'' '''	° '	' ''	'' '''	° '	' ''	'' '''	' ''
M		1			2			3			4		M
1	0	8	29		4	13		2	6		0	54	1
2	0	16	57		8	27		4	12		1	48	2
3	0	25	26		12	40		6	17		2	42	3
4	0	33	55		16	54		8	23		3	26	4
5	0	42	24		21	7		10	29		4	30	5
6	0	50	52		25	21		12	35		5	34	6
7	0	59	21		29	34		14	41		6	17	7
8	1	7	50		33	47		16	46		7	11	8
9	1	16	18		38	1		18	52		8	5	9
10	1	24	47		42	14		20	58		8	59	10
11	1	33	16		46	28		23	4		9	53	11
12	1	41	45		50	41		25	9		10	47	12
13	1	50	13		54	55		27	15		11	41	13
14	1	58	42		59	8		29	21		12	35	14
15	2	7	11	1	3	22		31	27		13	39	15
16	2	15	40	1	7	35		33	33		14	23	16
17	2	24	8	1	11	48		35	38		15	16	17
18	2	32	37	1	16	2		37	44		16	10	18
19	2	41	6	1	20	15		39	50		17	5	19
20	2	49	34	1	24	29		41	56		17	59	20
21	2	58	3	1	28	42		44	2		18	52	21
22	3	6	32	1	32	56		46	7		19	46	22
23	3	15	1	1	37	9		48	13		20	40	23
24	3	23	29	1	41	22		50	19		21	34	24
25	3	31	58	1	45	36		52	25		22	28	25
26	3	40	27	1	49	49		54	31		23	22	26
27	3	48	55	1	54	3		56	36		24	16	27
28	3	57	24	1	58	16		58	42		25	10	28
29	4	5	53	2	2	30	1	0	48		26	4	29
30	4	14	21	2	6	43	1	2	54		26	58	30

For Minutes, Seconds, and Thirds.

Tab. XXXIV.

′	°	′	″	°	′	″	°	′	″	°	′	″	′
″	′	″	‴	′	″	‴	′	″	‴	′	″	‴	″
M		1			2			3			4		M
31	4	22	50	2	10	57	1	4	59		27	52	31
32	4	31	19	2	15	10	1	7	5		28	46	32
33	4	39	48	2	19	23	1	9	11		29	40	33
34	4	48	17	2	23	37	1	11	17		30	33	34
35	4	56	45	2	27	50	1	13	23		31	27	35
36	5	5	14	2	32	4	1	15	28		32	21	36
37	5	13	43	2	36	17	1	17	34		33	15	37
38	5	22	11	2	40	31	1	19	40		34	9	38
39	5	30	40	2	44	44	1	21	46		35	3	39
40	5	39	9	2	48	57	1	23	52		35	57	40
41	5	47	48	2	53	11	1	25	57		36	51	41
42	5	56	6	2	57	24	1	28	3		37	45	42
43	6	4	35	3	1	38	1	30	9		38	39	43
44	6	13	4	3	5	51	1	32	15		39	33	44
45	6	21	33	3	10	5	1	34	21		40	27	45
46	6	30	1	3	14	18	1	36	27		41	21	46
47	6	30	30	3	18	31	1	38	32		42	15	47
48	6	46	59	3	22	45	1	40	38		43	9	48
49	6	55	38	3	26	58	1	42	44		44	2	49
50	7	3	56	3	31	12	1	44	50		44	56	50
51	7	12	25	3	35	25	1	46	55		45	50	51
52	7	10	54	3	39	39	1	49	1		46	44	52
53	7	29	23	3	43	52	1	51	7		47	38	53
54	7	37	51	3	48	6	1	53	13		48	32	54
55	7	46	20	3	52	19	1	55	19		49	26	55
56	7	54	49	3	56	32	1	57	24		50	20	56
57	8	3	17	4	0	46	1	59	29		51	14	57
58	8	11	46	4	4	59	2	1	35		52	8	58
59	8	20	15	4	9	12	2	3	41		53	4	59
60	8	28	43	4	13	26	2	5	48		53	56	60

A TABLE of the Mean Motions of the four Satellites in Time, to every Sign of Distance from Jupiter.

Tab. XXXV.

Signs.	1				2				3				4				Signs.
	D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	3	32	23	0	7	6	29	0	14	19	58	1	9	30	25	1
2		7	4	46		14	12	59	1	4	39	56	2	19	0	51	2
3		10	37	9		21	19	28	1	18	59	54	4	4	31	16	3
4		14	9	32	1	4	25	58	2	9	19	52	5	14	1	41	4
5		17	41	55	1	11	32	27	2	23	39	51	6	23	32	7	5
6		21	14	18	1	18	38	57	3	13	59	49	8	9	2	32	6
7	1	0	46	41	2	1	45	26	4	4	19	47	9	18	32	57	7
8	1	4	19	4	2	8	51	55	4	18	39	45	11	4	3	23	8
9	1	7	51	27	2	15	58	25	5	8	59	43	12	13	33	48	9
10	1	11	23	50	2	23	4	54	5	23	19	41	13	23	4	13	10
11	1	14	56	12	3	6	11	24	6	13	39	39	15	8	34	39	11
12	1	18	28	35	3	13	17	53	7	3	59	37	16	18	5	4	12

A TABLE of the Mean Motions of the Four Satellites in Time, to every Degree, Minute, and Second of Distance from Jupiter.

Tab. XXXVI.

S.	1 H.	1 M.	1 S.	2 H.	2 M.	2 S.	3 H.	3 M.	3 S.	4 H.	4 M.	4 S.
° ′ ″	′ ″	″ ‴	‴ ⁗	′ ″	″ ‴	‴ ⁗	′ ″	″ ‴	‴ ⁗	′ ″	″ ‴	‴ ⁗
0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	7	5	0	14	13	0	28	40	1	7	1
2		14	10		28	26		57	20	2	14	2
3		21	14		42	39	1	26	0	3	21	3
4		28	19		46	52		54	40	4	28	3
5		35	24	1	11	5	2	23	20	5	35	4
6		42	39		25	18		52	0	6	42	5
7		49	33		39	31	3	20	40	7	49	6
8		56	38		53	44		49	19	8	56	7
9	1	3	43	2	7	57	4	17	59	10	3	8
10		10	48		22	10		46	39	11	10	8
11		17	52		36	23	5	15	19	12	17	9
12		24	57		50	36		43	59	13	24	10
13		32	2	3	4	49	6	12	39	14	31	11
14		39	7		19	2		41	19	15	38	12
15		46	12		33	15	7	9	59	16	45	13
16		53	16		47	28		38	19	17	52	13
17	2	0	21	4	1	41	8	7	19	18	59	14
18		7	26		15	54		35	59	20	6	15
19		14	31		30	7	9	4	39	21	13	16
20		21	35		44	20		33	19	22	20	17
21		28	40		58	33	10	1	59	23	27	18
22		35	45	5	12	46		30	39	24	34	18
23		42	50		26	59		59	18	25	41	19
24		49	54		41	12	11	27	58	26	48	20
25		56	59		55	25		56	38	27	55	21
26	3	4	4	6	9	38	12	25	18	29	2	22
27		11	9		23	51		53	58	30	9	23
28		18	13		38	4	13	22	38	31	16	23
29		25	18		52	17		51	18	32	23	24
30		32	23	7	6	29	14	19	58	33	30	25

A Table of the Mean Motions of the Four Satellites in Time, to every Degree, Minute, and Second of Distance from Jupiter.

Tab. XXXVII.

S.	1		2		3		4		
	M.	S.	M.	S.	M.	S.	H.	M.	S.
′ ″ ‴	″ ‴	‴ ⁗	″ ‴	‴ ⁗	″ ‴	‴ ⁗	′ ″	″ ‴	‴ ⁗
30	3	32	7	6	14	20	0	33	30
31		39		21		49		34	37
32		47		35	15	17		35	44
33		54		49		46		36	51
34	4	1	8	3	16	15		37	58
35		8		18		43		39	5
36		15		32	17	12		40	12
37		22		46		41		40	20
38		29	9	0	18	9		42	27
39		36		14		38		43	34
40		43		29	19	7		44	41
41		50		43		35		45	48
42		57		57	20	4		46	55
43	5	4	10	11		33		48	2
44		11		26	21	1		49	9
45		19		40		30		50	16
46		26		54		59		51	23
47		33	11	8	22	27		52	30
48		40		22		56		53	37
49		47		37	23	25		54	44
50		54		51		53		55	51
51	6	1	12	5	24	22		56	58
52		8		19		51		58	5
53		15		33	25	19		59	12
54		22		48		48	1	0	19
55		29	13	2	26	17		1	26
56		36		16		45		2	33
57		44		30	27	14		3	40
58		51		45		43		4	47
59		58		59	28	11		5	54
60	7	5	14	12		40		7	1

A TABLE of Equation of Light to every Degree of Distance of the Heliocentrick Place of Jupiter from the Sun.

Tab. XXXVIII.

S.	0		1		2		3		4		5		S.
gr.	' +	''	' +	''	' +	''	' −	''	' −	''	' −	''	gr.
0	5	15	4	27	2	11	1	3	4	39	7	33	30
1		14		23		5		10		45		37	29
2		14		20	1	59		17		52		41	28
3		13		16		53		24		58		44	27
4		13		13		47		32	5	5		48	26
5		12		9		41		39		11		51	25
6		12		6		35		47		18		55	24
7		11		2		29		54		25		58	23
8		11	3	59		23	2	1		32	8	2	22
9		10		55		17		8		38		5	21
10		9		51		11		16		45		9	20
11		8		46		4		23		51		12	19
12		7		42	0	58		30		57		16	18
13		5		37		51		37	6	2		19	17
14		4		33		44		45		8		22	16
15		2		28		37		52		14		24	15
16		0		24		31		59		20		27	14
17	4	58		19		24	3	6		26		29	13
18		56		14		18		13		32		32	12
19		54		9		11		20		38		34	11
20		52		4	+	5		28		44		36	10
21		50	2	59	−	2		35		49		37	9
22		48		54		9		42		54		38	8
23		45		48		16		49		58		39	7
24		43		43		23		56	7	3		40	6
25		40		37		30	4	3		8		41	5
26		38		32		37		10		13		42	4
27		35		27		43		17		18		43	3
28		33		22		50		25		24		44	2
29		30		16		56		32		29		44	1
30		27		11	1	3		39		33		45	0
S.	11		10		9		8		7		6		

A Table of Equation of Light in another Form: In each the Light is supposed to pass from the Sun to our Earth in Seven Minutes.

Tab. XXXIX.

S.	0		1		2		3		4		5		S.
gr.	′ +	″	′ +	″	′ +	″	′ +	″	′ +	″	′ +	″	gr.
0	14	00	13	12	10	56	7	42	4	6	1	12	30
1	13	59		8		50		35		0		8	29
2		59		5		44		27	3	53		4	28
3		58		1		38		20		46		0	27
4		58	12	58		32		13		40	0	57	26
5		57		54		26		5		33		53	25
6		57		51		20	6	58		26		50	24
7		56		47		14		51		20		46	23
8		56		44		8		44		13		42	22
9		55		40		2		36		6		39	21
10		54		36	9	56		29		0		36	20
11		53		31		49		22	2	54		32	19
12		52		27		43		15		48		29	18
13		50		22		36		7		42		26	17
14		49		18		29		0		36		23	16
15		47		13		22	5	53		31		20	15
16		45		9		16		46		25		18	14
17		43		4		9		39		19		15	13
18		41	11	59		3		31		13		13	12
19		39		54	8	56		24		7		11	11
20		37		49		50		17		1		9	10
21		35		44		43		10	1	56		8	9
22		33		39		36		3		51		7	8
23		30		35		29	4	56		46		6	7
24		27		28		23		48		41		5	6
25		25		22		15		42		36		4	5
26		23		17		8		35		31		3	4
27		20		12		1		27		26		2	3
28		18		7	7	55		20		21		1	2
29		15		1		48		12		16		0	1
30		12	10	56		42		6		12		0	0
S.	11		10		9		8		7		6		

Increments of the Equation of Light to every Degree of the Heliocentrick Place of Jupiter.

Tab. XL.

S.	0		1		2		3		4		5		S.
gr.	′ +	″	′ +	″	′ +	″	′ +	″	′ +	″	′ +	″	gr.
10	0	0	0	13	0	49	1	40	2	34	3	15	10
11		0		14		50		42		36		16	9
12		0		15		52		44		38		17	8
13		0		16		53		46		39		18	7
14		0		17		55		48		41		19	6
15		0		18		56		50		42		20	5
16		0		19		58		52		44		21	4
17		1		20		59		53		45		22	3
18		1		21	1	1		55		47		23	2
19		1		22		3		56		48		24	1
20		2		23		5		58		50		25	30
21		2		24		6	2	00		51		25	29
22		2		25		8		2		53		26	28
23		3		26		9		4		54		26	27
24		3		27		11		6		56		27	26
25		4		28		12		8		57		27	25
26		4		29		14		10		59		28	24
27		5		30		16		11	3	1		28	23
28		5		31		18		13		3		28	23
29		6		32		20		14		4		29	21
30		6		34		22		16		5		29	20
1		7		35		23		18		6		29	19
2		7		37		25		20		7		29	18
3		8		38		26		22		8		30	17
4		8		40		28		23		9		30	16
5		9		41		30		25		10		30	15
6		9		43		32		27		11		30	14
7		10		44		34		28		12		30	13
8		11		47		36		30		13		30	12
9		12		48		38		32		14		30	11
10		13		49		40		34		15		30	10
S.	11		10		9		8		7		6		S.

Increments of the Equation of Light to every Degree of the mean Anomaly of Jupiter.

Tab. XLI.

S.	0		1		2		3		4		5		S.
gr.	' +	"	' +	"	' +	"	' +	"	' +	"	' +	"	gr.
0	3	30	3	17	2	41	1	49	0	57	0	15	30
1		30		16		39		47		55		14	29
2		30		15		38		46		53		13	28
3		30		14		36		44		51		12	27
4		30		13		35		43		50		11	26
5		30		12		33		41		48		10	25
6		30		11		31		39		46		9	24
7		30		10		29		37		44		8	23
8		29		9		28		35		43		7	22
9		29		8		26		33		41		6	21
10		28		7		25		31		40		6	20
11		28		6		23		29		38		5	19
12		28		5		22		27		37		5	18
13		27		4		20		25		36		4	17
14		27		3		19		24		35		4	16
15		26		2		17		22		33		3	15
16		26		1		15		21		32		3	14
17		25		0		13		19		30		2	13
18		25	2	58		11		18		29		2	12
19		24		56		9		16		27		1	11
20		24		55		7		14		26		1	10
21		24		53		5		12		24		1	9
22		23		52		3		10		23		1	8
23		23		50		1		8		22		1	7
24		22		49		0		6		21		0	6
25		22		48	1	58		4		20		0	5
26		21		47		57		3		19		0	4
27		20		45		55		1		18		0	3
28		19		44		53	1	0		17		0	2
29		18		42		51	0	58		16		0	1
30		17		41		49		57		15		0	0
S.	11		10		9		8		7		6		S.

Semidurations of the Eclipses of Jupiter's Satellites to every Degree of their Distance from their Nodes.

Tab. XLII. First Satellite.

S.	0 and 6			1 and 7			2 and 8			S.
gr.	H.	M.	S.	H.	M.	S.	H.	M.	S.	gr.
0	1	8	30	1	7	24	1	5	9	30
1		8	30			20			5	29
2		8	29			15			1	28
3		8	29			11		4	56	27
4		8	28			7			52	26
5		8	27			3			48	25
6		8	26		6	59			45	24
7		8	25			55			42	23
8		8	24			50			39	22
9		8	23			46			35	21
10		8	22			41			32	20
11		8	21			36			29	19
12		8	19			31			26	18
13		8	17			26			23	17
14		8	15			21			20	16
15		8	13			16			18	15
16		8	11			12			16	14
17		8	8			7			13	13
18		8	5			3			10	12
19		8	3		5	58			8	11
20		8	0			54			7	10
21		7	57			49			6	9
22		7	54			45			5	8
23		7	51			40			4	7
24		7	48			35			3	6
25		7	44			30			3	5
26		7	41			25			2	4
27		7	37			21			2	3
28		7	33			17			1	2
29		7	29			13			0	1
30	1	7	24	1	5	9	1	4	0	0
S.	11 and 5			10 and 4			9 and 3			S.

Tab. XLIII. Second Satellite.

S.	0 and 6			1 and 7			2 and 8		
gr.	H.	M.	S.	H.	M.	S.	H.	M.	S.
0	1	27	0	1	24	25	1	18	53
1		26	59			15			43
2			59		24	5			33
3			58		23	55			23
4			57			44			14
5			56			34		18	5
6			54			23		17	56
7			52			12			47
8			49		23	0			38
9			46		22	49			30
10			43			38			22
11			40			27			14
12			36			16		17	6
13			31		22	5		16	59
14			26		21	53			53
15			20			42			47
16			14			30			41
17			8			19			36
18		26	2		21	7			31
19		25	56		20	56			26
20			49			44			22
21			42			33			18
22			34			21			14
23			26		20	10			11
24			19		19	58			8
25			11			47			5
26		25	2			36			3
27		24	53			25			2
28			44			14			1
29			35		19	3			0
30	1	24	25	1	18	53	1	16	0
S.	11 and 5			10 and 4			9 and 3		

Semidurations of the Eclipses of Jupiter's Satellites to every Degree of their Distance from their Nodes.

Tab. XLIV. Third Satellite.

S.	0 and 6			1 and 7			2 and 8			S.
gr.	H.	M.	S.	H.	M.	S.	H.	M.	S.	gr.
0	1	48	0	1	39	1	1	18	0	30
1		47	59		38	26		17	17	29
2			57		37	51		16	35	28
3			53		37	15		15	53	27
4			49		36	38		15	12	26
5			43		36	0		14	31	25
6			37		35	22		13	52	24
7			29		34	43		13	14	23
8			20		34	3		12	36	22
9		47	9		33	22		11	59	21
10		46	57		32	41		11	23	20
11			44		31	59		10	48	19
12			30		31	17		10	15	18
13		46	14		30	35		9	44	17
14		45	58		29	52		9	14	16
15			49		29	8		8	45	15
16			22		28	24		8	18	14
17		45	2		27	40		7	52	13
18		44	41		26	55		7	28	12
19		44	18		26	10		7	5	11
20		43	55		25	26		6	44	10
21			30		24	40		6	25	9
22		43	4		23	56		6	8	8
23		42	38		23	11		5	53	7
24		42	[illegible]		22	26		5	40	6
25		41	40		21	41		5	28	5
26		41	10		20	56		5	18	4
27		40	39		20	12		5	10	3
28		40	8		19	28		5	5	2
29		39	35		18	44		5	2	1
30	1	39	1	1	18	0	1	5	0	0
S.	11 and 5			10 and 4			9 and 3			S.

Tab. XLV. Fourth Satellite.

0 and 6			1 and 7			2 and 8			S.
H.	M.	S.	H.	M.	S.	H.	M.	S.	gr.
2	23	0	1	50	41				0
	22	56		48	25				1
	22	49		46	2				2
	22	38		43	33				3
	22	24		40	58				4
	22	5		38	17				5
	21	42		35	30				6
	21	15		32	36				7
	20	44		29	34				8
	20	8		26	24				9
	19	28		23	5				10
	18	44		19	37				11
	17	55		15	58				12
	17	2		12	8				13
	16	5		8	4				14
	15	4	1	3	43				15
	13	58	0	59	4				16
	12	48		54	0				17
	11	34		48	26				18
	10	15		42	12				19
	8	52		34	53				20
	7	25		25	36				21
	5	53		9	47				22
	4	16	0	0	0				23
	2	34							24
2	0	48							25
1	58	56							26
	57	0							27
	54	59							28
	52	52							29
1	50	41							30
11 and 5			10 and 4			9 and 3			S.

A TABLE of Equations for the Fourth Satellite of Jupiter.

Tab. XLVI.

S.	0		1		2		3		4		5		S.
gr.	° '	''	° '	''	° '	''	° '	''	° '	''	° '	''	gr.
	Sub.		Sub.		Sub.		Sub.		Sub.		Sub.		
0	0	0	23	50	41	24	48	0	41	45	24	10	30
1	0	50	24	33	41	48	48	0	41	19	23	26	29
2	1	40	25	15	42	12	47	59	40	53	22	42	28
3	2	30	25	57	42	35	47	57	40	26	21	57	27
4	3	20	26	39	42	58	47	54	39	59	21	12	26
5	4	10	27	20	43	20	47	50	39	31	20	27	25
6	4	59	28	1	43	41	47	46	39	2	19	41	24
7	5	48	28	41	44	1	47	41	38	32	18	55	23
8	6	37	29	21	44	21	47	34	38	1	18	7	[illegible]
9	7	26	30	0	44	40	47	27	37	30	17	20	[illegible]
10	8	15	30	39	44	58	47	20	36	58	16	33	20
11	9	5	31	17	45	16	47	11	36	26	15	45	19
12	9	54	31	54	45	32	47	2	35	52	14	57	18
13	10	43	32	31	45	48	46	51	35	19	14	9	17
14	11	31	33	8	46	2	46	40	34	44	13	20	16
15	12	19	33	44	46	16	46	28	34	9	12	32	15
16	13	7	34	19	46	29	46	15	33	33	11	43	14
17	13	55	34	53	46	41	46	1	32	57	10	54	13
18	14	42	35	27	46	53	45	46	32	[illegible]	10	[illegible]	12
19	15	30	36	1	47	3	45	30	31	42	9	[illegible]	11
20	16	17	36	33	47	12	45	14	31	3	[illegible]	[illegible]	[illegible]
21	17	4	37	5	47	20	44	56	30	24	7	[illegible]	9
22	17	50	37	37	47	28	44	38	29	45	6	[illegible]	8
23	18	36	38	8	47	35	44	19	29	[illegible]	5	[illegible]	7
24	19	22	39	58	47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	9	6
25	20	7	39	7	47	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	12	[illegible]
26	20	52	39	36	47	52	43	18	27	2	3	22	4
27	21	37	40	4	47	55	42	56	26	20	2	[illegible]	3
28	22	22	40	32	47	58	42	33	25	37	1	41	2
29	23	6	40	58	47	59	42	9	24	54	0	51	1
30	23	50	41	24	48	0	41	45	24	10	0	0	0
	Add.		Add.		Add.		Add.		Add.		Add.		
S.	11		10		9		8		7		6		S.

The apparent Distance of the Satellites from the Centre of Jupiter in Semidiameters of Jupiter and Hundred Parts.

Tab. XLVII.

Distances of the Satellites from the Geocentrick Place of Jupiter.

S.	0 East, 6 West.				1 East, 7 West.				2 East, 8 West.				
	1	2	3	4	1	2	3	4	1	2	3	4	
gr.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	S. H.	gr.	
0	0 00	0 00	0 00	0 00	2 87	4 57	7 29	12 81	4 97	7 91	12 63	22 21	30
1	10	0 16	0 25	0 45	95	4 71	51	13 20	5 2	99	75	43	29
2	20	32	50	90	3 03	84	73	59	7	8 7	87	64	28
3	30	48	76	1 34	12	97	94	98	12	14	99	85	27
4	40	64	1 2	79	21	5 11	8 15	14 35	16	21	13 10	23 05	26
5	50	80	1 28	2 24	29	24	36	71	20	28	21	24	25
6	60	96	1 53	68	37	37	57	15 8	24	35	32	43	24
7	70	1 12	78	3 12	45	50	78	44	28	41	42	61	23
8	80	27	2 3	57	53	63	98	79	32	47	52	78	22
9	90	43	30	4 2	66	75	9 18	16 14	36	53	61	94	21
10	1 00	58	53	45	69	87	37	49	39	59	70	24 10	20
11	10	74	78	89	76	99	57	83	43	64	79	25	19
12	20	90	3 2	5 33	84	6 11	76	17 16	46	69	87	38	18
13	29	2 6	28	77	91	23	94	48	49	74	94	52	17
14	39	21	53	6 20	98	35	10 13	81	52	78	14 2	65	16
15	49	36	77	64	4 6	46	31	18 13	55	82	8	77	15
16	59	52	4 2	7 8	13	57	49	45	57	86	15	88	14
17	68	67	31	50	20	68	67	76	60	90	21	99	13
18	78	82	50	93	26	79	84	19 6	62	93	26	25 9	12
19	87	97	75	8 35	33	89	11 00	36	64	97	31	18	11
20	97	3 12	99	77	40	7 00	17	65	65	9 00	35	25	10
21	2 6	27	5 22	9 18	46	10	33	93	67	2	40	33	9
22	15	42	46	60	52	20	49	20 21	69	5	44	40	8
23	24	57	70	10 2	58	30	75	48	70	7	47	46	7
24	33	71	94	43	64	39	89	75	71	9	50	51	6
25	42	86	6 16	84	70	48	95	21 1	72	10	52	55	5
26	51	4 00	39	11 25	76	58	12 9	26	73	11	54	59	4
27	60	15	62	65	82	67	23	51	73	12	56	62	3
28	69	29	84	12 4	87	75	36	75	74	13	57	63	2
29	78	43	7 7	42	92	83	50	98	75	13	57	64	1
30	87	57	29	81	97	91	63	22 21	75	14	58	64	0
S.	11 West, 5 East.				10 West, 4 East.				9 West, 3 East.				

A Table of the mean Synodical Revolutions or Periods of the Eclipses of the Satellites of Jupiter.

Tab. XLVIII.

Rev.	1				2				3				4				Rev.
	D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.	
1	1	18	28	35	3	13	17	53	7	3	59	37	16	18	5	4	1
2	3	12	57	10	7	2	35	46	14	7	59	14	33	12	18	8	2
3	5	7	25	45	10	15	53	39	21	11	58	51	50	6	15	12	3
4	7	1	54	20	14	5	11	32	28	15	58	28	67	0	20	16	4
5	8	20	22	55	17	18	29	25	35	19	58	5	83	18	25	20	5
6	10	14	51	30	21	7	47	18	42	23	57	42	100	12	30	24	6
7	12	9	20	5	24	21	05	11	50	3	57	19	117	6	35	28	7
8	14	3	28	40	28	10	23	4	57	7	56	56	134	0	40	32	8
9	15	22	17	15	31	23	40	57	64	11	56	33	150	18	45	36	9
10	17	16	45	50	35	12	58	50	71	15	56	10	167	12	50	40	10
11	19	11	14	25	39	2	16	43	78	19	55	47	184	6	55	44	11
12	21	5	43	0	42	15	34	36	85	23	55	24	201	1	0	48	12
13	23	0	11	35	46	4	52	29	93	3	55	1	217	19	5	52	13
14	24	18	40	10	49	18	10	22	100	7	54	38	234	13	10	56	14
15	26	13	8	45	53	7	28	15	107	11	54	15	251	7	16	0	15
16	28	7	37	20	56	20	46	8	114	15	53	52	268	1	21	4	16
17	30	2	5	55	60	10	4	1	121	19	53	29	284	19	26	8	17
18	31	20	34	30	63	23	21	54	128	23	53	6	301	13	31	12	18
19	33	15	3	5	67	12	39	47	136	3	52	43	318	7	36	16	19
20	35	9	31	40	71	1	57	40	143	7	52	20	335	1	41	20	20

A Table of the Latitude, &c. of the First Satellite.

Tab. XLIX.

Degrees	Sig. 0	6				1	7				2	8				Degrees
	Lat.			Red.		Lat.			Red.		Lat.			Red.		
	°	′	″	′	″	°	′	″	′	″	°	′	″	′	″	
0	0	0	0	0	0	1	27	28	1	54	2	31	32	1	54	30
1		3	3	0	4		30	2	1	56		32	57	1	52	29
2		6	6	0	9		32	36	1	59		34	21	1	50	28
3		9	9	0	14		35	11	2	1		35	46	1	47	27
4		12	12	0	18		37	46	2	4		37	10	1	45	26
5		15	15	0	23		40	20	2	6		38	35	1	43	25
6		18	17	0	27		42	46	2	7		39	45	1	39	24
7		21	18	0	31		45	11	2	8		40	55	1	36	23
8		24	20	0	35		47	37	2	8		42	6	1	32	22
9		27	21	0	30		50	2	2	9		43	16	1	29	21
10		30	23	0	45		52	28	2	10		44	26	1	25	20
11		33	22	0	49		54	43	2	11		45	21	1	21	19
12		36	20	0	53		56	58	2	12		46	16	1	18	18
13		39	18	0	57		59	13	2	12		47	12	1	14	17
14		42	17	1	2	1	1	28	2	13		48	7	1	11	16
15		45	15	1	7		3	43	2	14		49	2	1	7	15
16		48	11	1	11		5	47	2	13		49	42	1	3	14
17		51	6	1	14		7	51	2	12		50	21	0	58	13
18		54	0	1	17		9	54	2	12		51	1	0	54	12
19		56	55	1	21		11	58	2	11		51	40	0	49	11
20		59	50	1	25		14	2	2	10		52	20	0	45	10
21	1	2	21	1	29		15	54	2	9		52	44	0	41	9
22		5	28	1	33		17	45	2	8		53	8	0	36	8
23		8	18	1	37		19	37	2	8		53	32	0	32	7
24		11	7	1	41		21	28	2	7		53	56	0	27	6
25		13	58	1	44		23	20	2	6		54	20	0	23	5
26		16	38	1	46		24	58	2	4		54	28	0	18	4
27		19	21	1	48		26	37	2	1		54	36	0	14	3
28		22	3	1	50		28	15	1	59		54	44	0	9	2
29		24	47	1	52		29	54	1	56		54	52	0	5	1
30		28	28	1	54		31	32	1	54		55	0	0	0	0
Deg.	Sig. 11	5				10	4				9	3				Deg.
	Lat.			Red.		Lat.			Red.		Lat.			Red.		

AN

ACCOUNT

Of the PRECEDING

TABLES.

Table the 1st, CONTAINS the mean Motions of *Jupiter* and his Aphelion, for common Julian Years, from 1 to 3000.

Tables the 2d, 3d, and 4th, Contain the Radical Place of *Jupiter* and his Aphelion, for current Years of Christ for the present Century, beginning at 1701, and ending at 1805.

Tables the 5th and 6th, Contain the mean Motions of *Jupiter*, for Months, Days, Hours, Minutes, and Seconds.

Table the 7th, Contains the Equations of the Orb of *Jupiter*, for reducing the mean Heliocentrick Place of *Jupiter*, to the true Heliocentrick Place.

Table the 8th, Contains the Place of the Sun for every Day of the Year 1742.

N. B. As the principal Use of the Sun's Place is to find the Equation of Light, and as this depends upon the Distance of the Sun from *Jupiter*, an Error of 8 Minutes in the Sun's Place, will cause but an Error of one Second in the Motion of Light in the Quadratures, and scarce any at the Opposition and Conjunction; and as the Variation of the Sun's Place amount but to 9 Minutes in 20 Years, this Table, though to Minutes only, is sufficiently true for all Purposes, and will serve to all Degrees of Exactness, till the Year 1760. But if greater Exactness be required, it is but adding 9 Minutes nearly

nearly for every twenty Years to the Sun's Place in the Table, and you will have it sufficiently exact for any Time to come.

~~Table the 9th, Contains the Equation of Days for the first Year~~ after Leap-Year.

Table the 10th, For the second Year.

Table the 11th, For the third Year after Leap-Year. And,

Table the 12th, For the Leap-Year.

Table the 13th, Contains the mean Motions of the four Satellites of *Jupiter* for common Julian Years, from 1 to 1000.

Tables the 14th, 15th, and 16th, Contain the Radical Place of *Jupiter's* four Satellites for the present Century, beginning at 1701, and ending at 1805.

Tables the 17th, 18th, and 19th, Contain likewise the Radical Places of the four Satellites of *Jupiter* for the present Century, beginning at 1701, and ending at 1805, from whence the preceding 14th, 15th, and 16th Tables are formed, by the Addition of the Motion of each Satellite, in 8 Minutes, 45 Seconds of Time, *viz.* by the Addition of one 1 Degree, 14 Minutes, and 11 Seconds, for the Radical Place of the first Satellite; 36 Minutes, 57 Seconds, for the Radical Place of the second; 18 Minutes, 20 Seconds, for that of the third Satellite; and 7 Minutes, 51 Seconds, for the Radical Place of the fourth Satellite.

Tables the 20th, 21st, *&c.* to the 31st, Contain the mean Motions of the four Satellites for every Day of the Year, from the first of *January* inclusive, to the 31st of *December* inclusive.

Table the 32d, Contains the mean Motions of the four Satellites for Hours.

Tables the 33d and 34th, Contain the mean Motions of the four Satellites, for Minutes and Seconds.

Tables the 36th and 37th, Contain the mean Motions of each of the four Satellites of *Jupiter* in Time. Table the 36th shews how long Time each Satellite requires to outrun *Jupiter*, 1, 2, 3, *&c.* Signs; and the 37th Table, how long Time the same Satellites requires to get before him, one Degree, one Minute, one Second, *&c.* For Example, Supposing *Jupiter*, and the first Satellite in Conjunction, at any given Time in 3 Hours, 32 Minutes, 32 Seconds, the first Satellite will be in Antecedence of *Jupiter* one Sign, in 7 Hours, 4 Minutes, 46 Seconds, two Signs, *&c.* Again, In 7 Minutes, 5 Seconds, the first Satellite will be removed at the

Distance

Distance of one Degree in 7 Seconds, 5 Thirds, one Minute, and in 7 Thirds, 5 Fourths, one Second of it's Orb; and the same Law obtains in the second, third, and fourth Satellites.

Table the 38th, Contains the Equation of Light to every Sign and Degree of Distance of the Heliocentrick Place of *Jupiter* from the Sun's Place, to be made use of with the 17th, 18th, and 19th Tables of the Radical Places of the Satellites.

Table the 39th, Contains likewise the Equation of Light to every Degree of Distance of the Heliocentrick Place of *Jupiter*, from the Place of the Sun, to be applied to the mean Time of the Immersion or Emersion of either Satellite, when the Radical Places of the Satellites in the 14th, 15th, and 16th Tables are made use of.

Table the 40th, Contains Increments of the Equation of Light to be added to the former Equation, to every Degree of the Heliocentrick Place of *Jupiter*.

Table the 41st, Contains the same Increments of Light to every Sign and Degree of *Jupiter's* mean Anomaly, in each of which Tables of Light, the Light is supposed to require seven Minutes to pass from the Sun to *Jupiter*.

Tables the 42d, 43d, 44th, and 45th, Contain the Semidurations of Eclipses of the first, second, third, and fourth Satellites, to every Sign and Degree of the Distance of the Satellite from it's Node; or, which is the same, to every Sign and Degree of the Distance of *Jupiter's* Heliocentrick Place from the same Node.

Table the 46th, Contains Equations of the Orb of the Fourth Satellite, for rectifying the mean Place of the Satellite, and reducing it to the true Place.

Table the 47th, Contains the apparent Distances of each of the four Satellites, from the Center of *Jupiter's* Body, in Semidiameters of *Jupiter* and Hundred Parts, to every Degree of the Distances of the Satellite, from the Geocentrick Place of *Jupiter*.

Table the 48th, Contains the mean Synodical Revolutions or Periodical Returns of the Eclipses of the Four Satellites, and after what Manner it was constructed, as well as it's Use, will be shewn at large hereafter in it's proper Place.

Table the 49th, Contains the Latitude and Reduction of the First Satellite, to every Degree of it's Distance from it's Node.

The Use of the TABLES.

ALL Astronomical Tables are founded upon mean or equal Time, so that if the Time given be apparent Time, it must first be reduced to mean or equal Time by the Help of the 9th, 10th, 11th, and 12th Tables, and to this End you must divide the given Year by 4, if nothing remains, it shews that it is Leap-Year, but if 1, 2, or 3, remains, it shews that the given Year is the 1st, 2d, or 3d Year after Leap-Year; then entring the corresponding Year, which is shewn by it's Title in the Column under the given Month, right against the Day in the Column of Days, you will have in the common Area, the true Equation of Time, which being added or substracted from the apparent Time, according to it's Title, will give the mean Time corresponding to the apparent Time given.

If the Places of *Jupiter*, or his Satellites, be computed to apparent Time, then the mean Motions of the Planets, answering to the Equation of Time, must be computed thus: If the Equation of Time be positive, it must be added to the Places already computed; but if the Equation of Time be negative, it must be substracted from the computed Place, and the Sum or Difference, according as the Case requires, will give the true Place of the Planet to the Time first given.

To find the Heliocentrick Place of JUPITER.

IF the Time given be apparent Time, it must be reduced to mean Time by the former Method.

1st Then, in the 2d, 3d, or 4th Tables, right against the given Year, you will have the Radical Place of *Jupiter*, as also the Place of his Aphelion.

2dly, In the 5th and 6th Tables, find the mean Motions answering to the Month, Day, Hour, and Minute; the Sum of all these mean Motions will give the mean Heliocentrick Place of *Jupiter*.

3dly, From the mean Heliocentrick Place of *Jupiter*, substract the Place of the Aphelion, the Remainder is the mean Anomaly.

4thly, With

4thly, With the mean Anomaly enter the 7th Table, and under the given Sign, and right against the given Degree, making proportional Allowance for the odd Minutes and Seconds, you will have the proper Equation of the Orb, this added to, or subtracted from, the mean Heliocentrick Place of *Jupiter*, as the Title directs, will give the true Heliocentrick Place of *Jupiter* at the Time proposed.

EXAMPLE I.

Let it be required to find the Heliocentrick Place of *Jupiter* for the first Day of *January*, 1735, at Noon, apparent Time.

The Year 1735 being the third Year after Leap-Year, the Equation of Time on the first of *January* at Noon, in the 11th Table, Page the 26th, will be found to be 8 Minutes, 52 Seconds to be added, whence the mean Time at Noon will be 8 Minutes, 52 Seconds. This being done proceed as follows:

Mean Time,	M.	M.	♃		M.	M.	Aph.		
	S.	°	'	''	S.	°	'	''	
1735	8	29	30	39	6	10	15	48	Place Aph.
January 1,	0	0	4	59	8	29	35	40	M. M. ♃
H. M. S.	0	0	0	2					
0 8 52					2	19	19	52	Mean Ano.
M. M. ♃	8	29	35	40	Mean Hel. Place of Jupiter.				
Equat. Sub.	—	5	21	42	Equation to be added.				
Hel. Place of ♃	8	24	13	58	True Hel. Place of Jupiter.				

EXAMPLE

EXAMPLE.

Let it be required to find the Heliocentrick Place of *Jupiter*, *December* 2, 1735, at 16 Hours, 30 Minutes, 42 Seconds, mean Time.

Mean Time,	M.	M.	♃		M.	M.	Aph.		
	S.	°	'	''	S.	°	'	''	
1735	8	29	30	39	6	10	15	48	Rad.Pl.Aph.
December 2	0	27	55	59	0	00	01	6	M.M. Aph.
H = 16	0	00	03	20					
M = 30 S = 47	0	00	00	6	6	10	16	54	Long. Aph.
					9	27	30	4	M. M. ♃
					3	17	13	10	Mean Ano.
M. M. ♃	9	27	30	4					Mean Hel. Place of Jupiter.
Equation	—	5	21	57					Equat. of the Orb negative.
Hel. Place of ♃	9	22	8	7					True Hel. Place of Jupiter.

N. B. In Leap-Years you must add the Motion of one Day to the given Time, after the 28th of *February*, *Ex. gr.* If the Day proposed was the 2d of *December*, you must take the mean Motions standing against the 3d of *December*, instead of the 2d Day.

To compute the Time when an Eclipse of any of the Four Satellites of Jupiter *will happen.*

1st, To the Time given compute the Heliocentrick Place of *Jupiter* by the former Precepts.

2dly, With the given Year, enter the 14th 15th, or 16th Tables, or the 17th, 18th, or 19th Tables, and take out thence the Radical Place of the Satellite.

3dly, With the Day of the Month enter the 20th, 21st, or 22d Tables, &c. and take out thence the corresponding mean Motions.

4th, With the given Hour enter the 32d Table, and take out thence the mean Motion answering thereto.

5thly, With

5thly, With the Minutes and Seconds, enter the 35th and 36th Tables, and take out thence the proper mean Motions.

6thly, Add these several mean Motions together, and the Sum will give the mean Place of the Satellite.

7th, If the mean Place of the Satellite be the same with the Heliocentrick Place of *Jupiter* before found, the Time given is the mean Time of the Conjunction of *Jupiter* and the Satellite, or the mean Time of the Eclipse incorrect. But if they differ, then

8thly, From the Heliocentrick Place of *Jupiter*, substract the mean Place of the Satellite, the Remainder will give the Distance of the Satellite from *Jupiter*.

9thly, With this Distance of the Satellite from *Jupiter*, enter the 35th and 36th Tables, that is, the 35th Table with the Signs, if any there be; and the 36th Table with the Degrees, Minutes, and Seconds, and take out the corresponding Times; and the Sum of all these Times being added to the given Time, will give the mean Time of the Conjunction, or middle of the Eclipse, incorrect.

10thly, From the Sun's true Place, at the Time given, substract the Heliocentrick Place of *Jupiter*, the Remainder will give the Distance of *Jupiter* from the Sun.

11th, With the Distance of *Jupiter* from the Sun, enter the 37th Table (if the Radical Place of the Satellite was taken out of the 17th, 18th, or 19th Table) and take out the first Equation of Light, this according to it's Title added to, or substracted from, the mean Time of the Conjunction, or middle of the Eclipse incorrect, will give the first equated Time of the Conjunction, or middle of the Eclipse.

But if the Radical Place of the Satellite was taken out of the 13th, 14th, or 15th Tables, then with the Distance of the Heliocentrick Place of *Jupiter* from the Sun, enter the 38th Table, and take out thence the proper Equation, this always added to the Time of the mean Conjunction, or middle of the Eclipse, will give the first equated Time of the mean Conjunction, or middle of the Eclipses, as before.

12th, With the Heliocentrick Place of *Jupiter*, enter the 39th Table, or with the mean Anomaly of *Jupiter*, enter the 40th Table, and take out of either the corresponding Equation, (which in both Cases will be the same) this always added to the first equated Time of the Conjunction, or middle of the Eclipses, will give the second

 equated

equated Time, or the true mean Time of the Conjunction, or middle of the Eclipse.

13th, With the Year, Month, Day, &c. given, enter the 9th, 10th, 11th, or 12th Tables, as the Case requires, and take out thence the Equation of Time; this contrary to it's Title applied to the mean Time of the Conjunction, &c. will give the apparent Time of the middle of the Eclipse.

14th, From the Heliocentrick Place of *Jupiter*, substract the Place of the Node of the Satellite, and with the Remainder, enter the 41st, 42d, 43d, or 44th Tables, as the Case requires, and take out thence the Semiduration of the Eclipse, this substracted from the apparent Time of the middle of the Eclipse, will give the apparent Time of the Immersion.——But the same Semiduration added to the apparent Time of the middle, will give the apparent Time of the Emersion.

EXAMPLE I.

Let it be required to find the first Eclipse of the first Satellite, that will happen after the first Day of *January*, 1735.

The Heliocentrick Place of *Jupiter* at that Time, has been already found to be 8 Signs, 24 Degrees, 13 Minutes, 58 Seconds, this being obtained, we must proceed in the Manner following.

By

By the 17th 18th, and 19th Tables of Radical Places.

	S.	°	'	''	
1735	11	20	42	46	Radical Place of the Satellite.
January 1,	6	23	29	20	M. M. for the 1st of January.
M. M. Satel.	6	14	12	6	M. Place of the Satellite.
Hel. Pl. of ♃	8	24	13	58	Heliocentrick Place of Jupiter.
Elongation	2	10	01	52	Dist. of the Satellite from Jupiter.

	D.	H.	M.	S.	
January	1	00	00	00	Time first given.
S = 2		7	4	46	Time the Satellite moves 2 Signs.
D = 10		1	10	48	Time the Sat. moves 16 Degrees.
M = 1				7	Time the Sat. moves 1 Minute.
S = 52				6	Time the Sat. moves 12 Seconds.
January	1	8	15	47	Mean Time of the Middle.
1st Eq. of Light		+	4	33	First Equation of Light.
1st Eq. of Time	1	8	20	20	First Equat. Time of the Middle.
2d Eq. of Light		+	2	8	Second Equation.
2d Eq. of Time	1	8	22	28	Second Equat. Time of the Middle.
Equat. of Days.		—	8	52	Equation of Time.
Ap. Time	1	8	13	36	Ap. Time of the Middle.
Semiduration		1	6	11	Semiduration.
January	1	7	7	25	Immersion.
	1	9	19	47	Emersion.

S.	°	'	
9	22	14	The Place of the Sun.
8	24	14	The Heliocentrick Place of Jupiter.
0	28	00	Distance of Jupiter from the Sun.
S.	°	''	
8	24	14	Place of the Satellites at the Conjunction.
10	10	30	Place of the Node of the Satellites.
10	13	44	Distance of the Satellites from it's Node.

N. B. The Radical Place of the Satellite is taken out of the 17th Table.

By

By the 14th, 15th, or 16th Tables of Radical Places.

	S.	°	'	"	
1735	11	21	56	57	Radical Place of the Satellite.
January 1,	6	23	29	20	M. M. Sat. for one Day.
M. M. Sat.	6	15	26	17	Mean Place of the Satellite.
M. Place ♃	8	24	13	58	Heliocentrick Place of Jupiter.
Elongation	2	8	47	41	Distance of the Sat. from Jupiter.

	D.	H.	M.	S.	
January	1	00	00	00	Time first given.
S = 2		7	4	46	Mean Motion of the Sat. from
D = 8		0	56	38	Jupiter in Time, answering to
M = 47			5	33	2 Signs, 8 Degrees, 47 Minutes,
S = 41				5	41 Seconds.
January	1	8	7	2	= M. Time of the ☍ or Middle.
		+	13	18	= First Equation of Light.
	1	8	20	20	= First equated Time.
		+	2	8	= Second Equation of Light.
	1	8	22	28	= Second equated Time.
		—	8	52	Equation of Time.
	1	8	13	36	Ap. Time of the Middle.
		1	6	11	Simiduration.
	1	7	7	25	= Immersion.
	1	9	19	47	= Emersion.

S.	°	"	
9	22	14	The Place of the Sun.
8	24	14	The Heliocentrick Place of Jupiter.
0	28	00	Distance of Jupiter from the Sun.

S.	°	'	
8	24	14	Place of Jupiter, or the Satel. at the Conjunction.
10	10	30	Place of the Node of the Satellite.
10	13	44	Distance of the Satellite from it's Node.

N. B. From

N. B. From the Time of the Conjunction of the Sun with *Jupiter*, though the Time of the Opposition, the Satellite emerges out of the Shadow of *Jupiter*, behind his Body, whence by this Interposition they become invisible, and therefore the Immersion are only taken Notice of; and on the contrary, from the Opposition of the Sun and *Jupiter* back again to the Conjunction, the Satellite immerges into the Shadow behind his Body, whence it came to pass, that during this Space of Time, the Emersions are only visible, the Immersion being rendered useless by the Interposition of the Body of *Jupiter*, and consequently never mentioned in the Catalogues of Eclipses.

If the given Time consisted of Hours, Minutes, and Seconds, then the proper mean Motions must be taken out of the 32d, 33d, and 34th Tables, and being added to the mean Motions for the Year and Day of the Month, will give the mean Place of the Satellite, at the Time proposed, after which you must proceed in the Manner made use of in the former Examples.

EXAMPLE II.

Let it be required to find when the next Eclipse of the Second Satellite will happen, after the first Day of *January*, 1735.

The Heliocentrick Place of *Jupiter* at that Time, has been found to be 8 Signs, 24 Degrees, 13 Minutes, 58 Seconds, whence to find the Time of the next Eclipse, proceed as in the following Example.

By the 14th, 15th, or 16th Tables of Radical Places.

	S.	°	'	''	
1735	11	12	32	3	= Radical Place of the Satellite.
January 1,	3	11	22	29	= M. M. for the given Day.
M. M. Sat.	2	23	54	32	= Mean Place of the Satellite.
♃ Place	8	24	13	58	= Heliocentrick Place of Jupiter.
Elongation	6	00	19	26	= Distance of the Sat. from Jupit.

	D.	H.	M.	S.	
	1	00	00	00	Time first given.
S = 6	1	18	38	57	Mean Motion of the Sat. in Time, answering to the Interval.
D = 0	0	0	00	00	
M. = 19	0	0	4	30	
S = 25				6	
January	2	18	43	33	= M. Time of the Middle.
		+	13	18	= First Equation of Light.
	2	18	56	51	= First equated Time.
		+	2	08	= Second Equation of Light.
	2	18	58	59	= True mean Time of the Mid.
		—	9	32	Equation of Time.
	2	18	49	27	= Ap. Time of the Middle.
		1	21	27	= Simiduration.
	2	17	28	00	= Immersion.
	2	20	10	54	= Emersion.

S.	°	''	
9	22	14	The Place of the Sun.
8	24	14	The Heliocentrick Place of Jupiter.
0	28	00	Distance of Jupiter from the Sun.
S.	°	'	
8	24	14	Place of the Satel. or Jupiter at the Conjunction.
10	10	30	Place of the Node of the Satellite.
10	13	44	Distance of the Satellite from it's Node.

By

By the 17th 18th, and 19th Tables of Radical Places.

	S.	°	′	″	
1735	11	11	55	6	= Radical Place of the Satellite.
January 1,	3	11	22	29	= M. M. for the given Day.
M. M. Satel.	2	23	17	35	= Mean Place of the Satellite.
♃ Place	8	24	13	58	Heliocentrick Place of Jupiter.
Elongation	6	00	56	23	= Dist. of the Satellite from ♃.

	D.	H.	M.	S.	
January	1	00	00	00	Time given.
S = 6	1	18	38	57	Mean Motion of the Satellite in Time, corresponding to the Interval.
D = 0	0	0	0	0	
M = 56			13	16	
S = 23				5	
January	2	18	52	18	= Mean Time of the Middle.
		+	4	33	= First Equation of Light.
	2	18	56	51	= First Equat. Time of the Mid.
		+	2	08	= Second Equation of Light.
	2	18	58	59	= Second Equat. Time of the Mid.
		—	9	32	= Equation of Time.
	2	18	49	27	= Ap. Time of the Middle.
		1	21	27	= Semiduration.
	2	17	28	00	= Immerfion.
	2	20	10	54	= Emerfion.

S.	°	″	
9	22	14	= The Place of the Sun.
8	24	14	= The Heliocentrick Place of Jupiter.
0	28	00	Diftance of Jupiter from the Sun.

S.	°	′	
8	24	14	= Place of the Satellites at the Conjunction.
10	10	30	= Place of the Node.
10	13	44	= Diftance of the Satellites from it's Node.

N. B. The

N. B. The Second Satellite, as well as the First, by Reason of it's near Distance to *Jupiter*, emerges behind his Body, from the Time of the Conjunction to the Time of the Opposition, and in like Manner as the First, from the Time of the Opposition again to the Conjunction, it immerges behind the Body likewise, so that in this, as well as in the first, the Emersions from the Conjunction to the Opposition, and the Immersions from the Opposition back again to the Conjunction, are omitted in the Catalogue of Eclipses. Since they are rendered invisible to us by the Interposition of *Jupiter*'s Body.

EXAMPLE III.

Let it be required to find the Time when the first Eclipse of the third Satellite will happen, next after the first of *January* 1735.

The Heliocentrick Place of *Jupiter* has been found to be 8 Signs, 24 Degrees, 13 Minutes, 58 Seconds.

Wherefore,

	S.	°	′
From the Place of the Sun — — —	9	22	14
Take the Heliocentrick Place of Jupiter —	8	14	14
Remains the Distance of Jupiter from the Sun —	0	28	00

Again,

	S.	°	′
From the Place of the Satellite — — —	8	24	14
Take the Place of the Node — — —	10	10	30
Remains the Distance of the Satellite from it's Node	10	13	44

Then

Then by the 17th 18th, and 19th Tables of Radical Places.

	S.	°	′	″	
1735 =	8	6	49	26	= Radical Place of the Satellite.
January 1, =	1	20	19	03	= M. M. of the Sat. for 1st Jan.
M. M. Satel. =	9	27	08	29	= Mean Place of the Satellite.
♃ Place =	8	24	13	58	Heliocentrick Place of Jupiter.
Elongation	10	27	5	29	= Dist. of the Satellite from ♃.

	D.	H.	M.	S.	
January	1	00	00	00	= Time first given.
S = 0	5	23	19	41	Time the Sat. is moving 7 Signs.
D = 27		12	53	58	Time the Sat. is moving 27 Deg.
M = 5			2	28	Time the Sat. is moving 5 Min.
S = 29				14	Time the Sat. is moving 29 Sec.
January	7	12	16	46	= Mean Time of the Middle.
		+	4	33	= First Equation of Light.
	7	12	20	49	= First Equat. Time of the Mid.
		+	2	08	= Second Equation of Light.
	7	12	22	57	= M. Time of the visible Conj.
		—	8	52	= Equation of Time.
	7	12	14	5	= Ap. Time of the Middle.
		1	28	13	= Semiduration.
	7	10	45	52	= Immersion.
January	7	13	42	18	= Emersion.

By

By the 14th, 15th, or 16th Tables of Radical Places.

	S.	°	′	″		
1735 =	8	7	7	46	=	Radical Place of the Satellite.
January 1, =	1	20	19	3	=	M. M. for the 1st of January.
M. M. Sat.	9	27	26	49	=	Mean Place of the Satellite.
Hel. Pl. ♃	8	24	13	58	=	Heliocentrick Place of Jupiter.
Elongation	10	26	47	09	=	Distance of the Sat. from Jupit.

	D.	H.	M.	S.	
January	1	00	00	00	Time first given.
S = 10	5	23	19	41	Time answering to the Difference of the mean Motion of the Satellite and Jupiter, during the Interval.
D = 26		12	25	18	
M. = 47			22	27	
S = 9				4	
January	7	12	07	30	= M. Time of the Middle.
		+	13	18	= First Equation of Light.
	7	12	20	48	= First equated Time of the M.
		+	2	08	= Second Equation of Light.
	7	12	22	56	= Second equat. Time of Mid.
		—	8	52	= Equation of Time.
	7	12	14	4	= Ap. Time of the Middle.
		1	28	13	= Simiduration.
	7	10	45	51	= Immersion.
	7	13	42	17	= Emersion.

The

The Immersions of the third Satellite, as well as those of the first and second Satellite, are visible from the Conjunction to the Opposition of the Sun and *Jupiter*, and the Emersions back again, from Opposition to the Conjunction, are constantly visible; but by Reason of the great Distance of the third Satellite from *Jupiter*, in Comparison of the first and second, the Emersions from the first Octant to the third, that is, about six Weeks before, and after the first Quadrature, are also visible; and, on the contrary, while *Jupiter* is passing from the third to the fourth Octant, that is, about six Weeks before and after the second Quadrature; the Immersions of the third Satellite, as well as the Emersions, are also visible, so that near one half of the Time that *Jupiter* is visible, the Immersions and Emersions of the third are also visible.

EXAMPLE IV.

Let it be required to find the Time when the first Eclipse of the fourth Satellite, next after the first of *January* 1735, will happen.

The Heliocentrick Place of *Jupiter* has been found to be 8 Signs, 24 Degrees, 13 Minutes, 58 Seconds.

Wherefore,

	S.	°	′
From the Place of the Sun — — —	9	22	14
Take the Heliocentrick Place of Jupiter —	8	14	14
Remains the Distance of Jupiter from the Sun —	0	28	00

Again,

	S.	°	′
From the Place of the Satellite — — —	8	24	14
Take the Place of the Node — — —	10	10	30
Remains the Distance of the Satellite from it's Node	10	13	44

Then

Then by the 17th, 18th, and 19th Tables of Radical Places.

	M. M. Sat.				M. M. Ap.				
1735	2	28	4	12	11	18	48	00	= Pl. of the Ap.
January 1,	0	21	34	16	3	19	38	28	= M. M. Sat.
M. M. Sat. =	3	19	38	28	4	00	50	28	M. Anomaly.
Equation =	—	0	41	23					
M. P. Cor. =	3	18	57	05					
♃ Place =	8	24	13	58					
Elongation	5	5	16	53					

	D. H. M.	S.	D. H. M. S.
S. 5 =	6 23 32	7	1 0 0 0
D. 5 =	5 35	4	7 5 25 34
M. = 16 =	17 52		
S. = 28 =		31	8 5 25 34
	7 5 25 34		

	S.	°	'	"	S.	°	'	"	
1735	2	28	4	12	11	18	48	00	Place of the Ap.
January 8	5	22	34	9	8	25	30	57	M. M. Sat.
H = 5		4	29	38					
M = 25			22	28	9	06	42	57	M. Anom.
S = 34				30					
M. M. Sat.	8	25	30	57					
Equation	+	0	47	37					
Place of the Sat.	8	26	18	34					
♃ Place =	8	24	50	00					
Elongation		1	28	34					

		H.	M.	S.
Deg.	1 — —	1	7	1
Min.	28 — —		31	16
Sec.	34 — —			38
Interval Sat.		1	38	55

	D. H. M. S.
From the last Time	8 5 25 34
Take the Interval	1 38 55
Mean Conjunction	8 3 46 39

By

By the 17th, 18th, and 19th Tables of Radical Places.

	M. M. Sat.			
1735	2	28	4	12
January 8.	5	22	34	9
H = 3		2	41	47
M = 46			41	21
S. = 39				35
M. M. Sat.	8	24	02	04
Equation	+	0	47	46
True Place	8	24	49	50
♃ Place	8	24	49	50
Elongation	0	00	00	0

M. M. Ap.				
11	18	48	0	M. M. Ap.
8	24	2	4	M. M. Sat.
9	05	14	4	M. Anom.

	S.	°	′
Sun's Place — —	9	29	30
Jupiter's Place — —	8	24	59
Jupiter from the Sun	1	04	31
Jupiter's Place — —	8	24	59
Place of the Node —	10	10	30
Jupiter from the Node	10	14	29

	D.	H.	M.	S.
Mean Time of the true Conjunction — — — — —	8	3	46	44
First Equation of Light — — — — — — — —		+	4	11
First equated Time — — — — — — — — —	8	3	50	55
Second Equation of Light — — — — — — —		+	2	9
True middle of the Eclipse — — — — — — —	8	3	53	04
Equation of Days — — — — — — — — — —		—	11	20
Apparent Time of the middle — — — — — — —	8	3	41	44
Simiduration — — — — — — — — —		1	1	20
Immersion — — — — — — — — — — — —	8	2	40	24
Emersion — — — — — — — — — — — — —	8	4	43	04

By the 14th, 15th, and 16th Tables of Radical Places.

	M.	M.	Sat.	
1735	2	28	12	3
January 8	5	22	34	9
H = 3		2	41	47
M = 38			34	9
M. M. Sat.	8	24	02	08
Equation	+	0	47	46
True Place =	8	24	49	54
♃ Place	8	24	49	54
♃ from the Sat.	0	00	00	00

S.	°	′	″	
11	18	48	00	M. M. Ap.
8	24	2	08	M. M. Sat.
9	05	14	08	M. Anomaly.

	S.	°	″
Sun's Place —— —	9	29	30
Jupiter's Place ——	8	24	51
Jupiter from the Sun	1	04	31
Jupiter's Place — —	8	24	51
Place of the Node —	10	10	30
Jupiter from the Node	10	14	21

	D.	H.	M.	S.
Mean Time of the true Conjunction — — — —	8	3	38	00
First Equation of Light — — — — — — — — —		+	12	56
First equated Time of the middle — — — — — — —	8	3	50	56
Second Equation of Light — — — — — — — —		+	2	9
Second equated Time of the middle — — — — — —	8	3	53	5
Equation of Days — — — — — — — — — — —		—	11	20
Apparent Time of the middle — — — — — — —	8	3	41	45
Semiduration of the Eclipse — — — — — — —		1	1	20
Immersion apparent Time — — — — — — — —	8	2	40	25
Apparent Time of the Emersion — — — — — —	8	4	43	05

In

In computing Eclipses of the fourth Satellite, Regard must be had to the 46th Table, intituled, *A Table of Equations for the Fourth Satellite of Jupiter*, and to this End you must substract the Place of the Apsides from the mean Motion, and with the Remainder, entering the Table, you must take out thence the proper Equation; this according to it's Title, added to, or substracted from, the mean Place of the Satellite, will give it's true Place, as may be seen in the former Examples, and it is upon the Account of this Inequality, that in computing the Time when the next Eclipse will happen, after the Time given, that if the Interval be much, there must be a Repetition of the Calculus, since the Equation in the first Supposition being 0 Degrees, 41 Minutes, 43 Seconds negative, and in the second, 0 Degrees, 47 Minutes, 46 Seconds positive, the Sum of these two Equations will amount to 1 Degree, 29 Minutes, 9 Seconds, equal in Time to 1 Hour, 39 Minutes, 34 Seconds, the Error arising at the second Calculation, and this Rule must be observed in all Computations.

The Time when any Eclipse of any of the Four Satellites will happen, being known or given, the Time when the next Eclipse of the same Satellite will happen, may be found, by adding the Time of the Synodical Revolution of the Satellite, to the Time first given, and the Sum will give the Time of the next succeeding Eclipse nearly, thus: If to *January* 1 Day, 8 Hours, 22 Minutes 28 Seconds, the mean Time of the Middle of the Eclipses of the first Satellite, deduced from the former Calculation, be added, 1 Day, 18 Hours, 28 Minutes, 35 Seconds, the Synodical Revolution of the same Satellite, you will have *January* 3 Days, 2 Hours, 51 Minutes, 3 Seconds, for the mean Time of the next Eclipse. Again, If *January* 3d, at 2 Hours, 51 Minutes, 3 Seconds, we add the same Synodical Revolution, the Sum will give *January* the 4th, at 21 Hours, 19 Minutes, 38 Seconds, for the next, *&c.* Again, If to *January* the 2d, at 18 Hours, 58 Minutes, 59 Seconds, the Time of the Conjunction of the Second Satellite, be added, 3 Days, 13 Hours, 17 Minutes, 53 Seconds, the Synodical Revolution of the Second Satellite, the Sum will give *January* the 6th, at 8 Hours, 16 Minutes, 52 Seconds, for the Time of the next Conjunction, or middle of the Eclipse; and again, If to this Time be added, the same Revolution of 3 Days, 13 Hours, 17 Minutes, 53 Seconds, the Sum will

will give *January* the 9th, at 21 Hours, 34 Minutes, 45 Seconds, for the next Conjunction.——In like Manner, If to *January* the the 7th, at 12 Hours, 22 Minutes, 56 Seconds, be added 7 Days, 3 Hours, 59 Minutes, 37 Seconds, the Synodical Revolution of the third Satellite, the Sum will give *January* the 14th, at 16 Hours, 22 Minutes, 33 Seconds, for the middle of the next Eclipse nearly. And again, If to this last Time be added the same Revolution of 7 Days, 3 Hours, 59 Minutes, 37 Seconds, the Sum will give *January* the 21st, at 20 Hours, 22 Minutes, 10 Seconds, for the next Conjunction. And lastly, If to *January* the 8th, at 3 Hours, 53 Minutes, 4 Seconds, the Time of the Conjunction of the fourth Satellite, or middle of the Eclipse, be added 16 Days, 8 Hours, 5 Minutes, 4 Seconds, the Time of the Synodical Revolution of the fourth Satellite, you will have *January* the 24th, at 11 Hours, 58 Minutes, 8 Seconds, for the Time of the next Conjunction, or middle of the Eclipse; and after the same Manner may a Series of Eclipses for any Series of Time be found.

In these Calculations hitherto made, I have had no Regard to the Reduction arising from the Inclination of the Orb, it being of very small Consequence.

The Inclination of the Orb of the fourth Satellite of *Jupiter* being greater than the Semidiameter of *Jupiter*'s Shadow, in that Part of the Cone through which the Orb of the Satellite passes, causes the Satellite to pass wide of the Shadow for about a Year before; and after the first and third Quadrature, whence it came to pass, that no Eclipses of the fourth Satellite can happen, during one third Part of his Revolution round the Sun, as shall be explained more at large in it's proper Place.

To exhibit the Appearances of *Jupiter*'s Satellites, as they will be seen by a Spectator upon the Surface of the Earth at any Time proposed.

1st, To the given Time collect the mean Motions of the Satellites, corresponding to the Year, Month, Day, Hour, Minute, and Second, out of the 17th, 18th, 19th, 20th, 21st, &c. Tables, and the Sum of these several mean Motions will give the mean Place of each of the Satellites.

2d, From the mean Place of the Satellite thus obtained, substract the Geocentrick Place of *Jupiter*, and the Remainder will give the Distance of each Satellite in it's Orb, from the Place of *Jupiter*.

3d, With

3d, With this Distance of the Satellite from *Jupiter* in it's Orb, enter the 47th Table, and under the Sign, and right against the Degree in the first or last Column, making proportionable Allowance for the Minutes and Seconds, you will have the apparent Distance of the Satellite from the Center of *Jupiter*, in his Semidiameters and hundred Parts.

Now if the Distance of the Satellite in it's Orb from *Jupiter* be less than six Signs, the Satellite will appear on the East Side of *Jupiter*, or on the left Hand, but if the Distance of the Satellite from *Jupiter* be more than six Signs, the Satellite will appear on the Western Side, or on the right Hand of *Jupiter's* Body.

EXAMPLE.

Let it be required to exhibit the Appearance of the four Satellites of *Jupiter*, on the first of *January* 1735, at 7 Hours, 7 Minutes, 25 Seconds in the Afternoon, when the first Satellite will immerge into the Shadow of *Jupiter*.

The OPERATION.

Time	1			2			3			4		
	S.	°	′	S.	°	′	S.	°	′	S.	°	′
1735	11	20	43	11	11	55	0	6	49	2	28	4
January 1	6	23	29	3	11	22	1	20	19	0	21	34
Hours 7	1	29	21	0	29	34	0	14	41	0	6	18
M=7 S=25			59			30			15			6
M. P. Sat.	8	14	32	3	23	21	10	12	4	3	26	2
♃ Geo. Place.	8	28	30	8	28	30	8	28	30	8	28	30
♃ from the Sat.	11	16	2	6	24	51	1	13	34	6	27	32
Dist. from ♃		1	38		3	84		10	4		11	86

Thus the Satellites will appear, if they could be ſeen with the naked Eye, or through the Reflector, but if they are viewed thro' the common Teleſcopes, compoſed of two convex Glaſſes, they will appear quite contrary, as in the following Figure, that is, thoſe that are on the Eaſt Side will appear on the Weſt Side; thoſe on the Weſt Side will appear on the Eaſt Side; and thoſe which, by Reaſon of their Latitudes, will appear above the Plan of *Jupiter*'s Orb, will appear below; and thoſe that by Reaſon of their Southern Latitude, would be ſeen by the naked Eye (if poſſible) below the Plan of the Orb, will be ſeen above it in the Glaſs.

The

The Construction of the TABLES.

THE Magnitudes, Periods, and Distances of the Satellites from *Jupiter*, as well as the Inclinations of their Orbs, or greatest Heliocentrick Latitudes; the Place of their Nodes or Points, where their Orbs intersect the Orb of *Jupiter*; also the Places of their Apsides and Excentricity (if any there be) are all determined from Observations; these being therefore supposed to be known or given, the Tables themselves are constructed after the Manner following.

Table the first, Column the first, contains the mean Motions of *Jupiter* for common Julian Years, and is made after this Manner:

It has been found by Observation, that *Jupiter* returns to the same Place in his Orb, from whence he began to move, in 11 Years, 313 Days, or 4330 Days, 8 Hours, 38 Minutes, 24 Seconds, or in 4330 Days and 36 decimal Parts of a Day; now if 1296000, the Seconds in a Circle, be multiplied by 365, the Days in a common Julian Year, the Product 473040000 being divided by 4330.63, the Time of *Jupiter*'s Revolution in his Orb, the Quotient 109238 Seconds, equal to 30 Degrees, 20 Minutes, 38 Seconds, the Arch of his Orb that he moves over in 365 Days, will give his mean Motion for one common Julian Year, this being doubled, will give 2 Signs, 0 Degrees, 41 Minutes, 16 Seconds, his mean Motion for 2 Years, and being tripled, will give 3 Signs, 1 Degree, 1 Minute, 54 Second, his mean Motion for 3 Years.

Again, If 109238, the Seconds that *Jupiter* moves over in one Year, be divided by 365, the Days in a common Julian Year, the Quotient, 299.3 Seconds, or 4 Minutes, 59 Seconds, 18 Thirds, will give his mean Motion for one mean Day; and again, If the last Quotient 299 be divided by 24, the Hours in a Day, the Quotient will give 12 Seconds, 27 Thirds, the Motion for one Hour, the 1-60th of which, *viz.* 12 Thirds, 27 Fourths, will be the mean Motion for one Second, *&c.*

Now inasmuch as every 4th Year is increased one Day, so to find the mean Motion for the 4th Year, to 3 Signs, 1 Degree, 1 Minute, 54 Se-

54 Seconds, the mean Motion for 3 Years, we muſt take 1 Sign, 0 Degrees, 20 Minutes, 38 Seconds, the mean Motion for one Year, increaſed by 4 Minutes, 59 Seconds, the mean Motion for one Day, *viz.* 1 Sign, 0 Degrees, 25 Minutes, 37 Seconds, and the Sum 4 Signs, 1 Degree, 27 Minutes, 31 Seconds, will give the mean Motion for 8 Years; and this being doubled, will give 8 Signs, 2 Degrees, 55 Minutes, 3 Seconds, the mean Motion for 8 Years, being tripled, will give 0 Signs, 4 Degrees, 22 Minutes, 34 Seconds, the mean Motion for 12 Years; and being quintupled, will give 8 Signs, 7 Degrees, 17 Minutes, 38 Seconds, the mean Motion for 20 Years; and this again being multiplied by 5, will give 5 Signs, 6 Degrees, 28 Minutes, 11 Seconds, the mean Motion for 100 Years, *&c.*

And by adding the Motions for the intermediate Years, you will have the whole Series of mean Motions.

Again, if 4 Minutes, 59 Seconds, 18 Thirds, the mean Motion for one Day, which ſtands againſt the firſt of *January*, be doubled, the Sum 9 Minutes, 58 Seconds, 36 Thirds, or 9 Minutes, 59 Seconds, will be the mean Motion for two Days, which ſtands againſt the 2d of *January*, and thus by the continual Addition of 4 Minutes, 59 Seconds, 18 Thirds, the mean Motion of the preceding Day, you will have the mean Motion of the ſucceeding Day, till when you come to the 31ſt of *December*, you will have 1 Sign, 0 Degrees, 20 Minutes, 38 Seconds, for the mean Motion anſwering to that Day, or to one common *Julian* Year; and after this Manner is the 5th Table, ſhewing the mean Motions to every Day of the common *Julian* Year conſtructed.

Again, by dividing the mean Motion for one Day, by 24, we ſhall have 12 Seconds, 28 Thirds, the mean Motion for one Hour, which being doubled, will give 24 Seconds, 56 Thirds, the mean Motion for 2 Hours, *&c.* Again, Becauſe one Minute is the 1-60th Part of an Hour, 12 Thirds, 28 Fourths, the 1-60th Part of 12 Seconds, 28 Thirds, will be the mean Motion for 1 Minute, 24 Thirds, 56 Fourths, the mean Motion for two Minutes, &c. and after this Manner is the 6th Table made.

The 3d Column of the firſt Table, contains the mean Motions of *Jupiter*'s Aphelion for common *Julian* Years, and it being found by Obſervation, that it moves at the Rate of 1 Minute, 12 Seconds, *per Annum*, the mean Motion for two Years, will be

be 2 Minutes, 24 Seconds, for 3 Years, the Triple of 1 Minute, 12 Seconds, *viz.* 3 Minutes, 36 Seconds, for 4 Years 4 Minutes, 48 Seconds, for 20 Years, 24 Minutes, for 100 Years 2 Degrees, and after this Manner is that Column formed.

The 2d, 3d, and 4th Tables, contain the Epocha, or Roots of the mean Motions of *Jupiter* and his Aphelion for the current Years of Christ; they are the mean Places of *Jupiter* and his Aphelion, for the 31st Day of *December* at Noon, preceding the Year to which they are annexed, and are determined from Observations, any one of which being known or given, the rest are found by Addition or Substraction of the mean Motion for common *Julian* Years. For Example, the Root 6 Signs, 24 Degrees, 26 Minutes, 51 Seconds, placed against the Year 1721, is the mean Place of *Jupiter*, *Decemcer* the 31st, 1720, at Noon, as is 6 Signs, 9 Degrees, 59 Seconds, 0 Fourths, the Number in the second Column, the mean Place of the Aphelion at the same Time; now if from 6 Signs, 24 Degrees, 26 Minutes, 51 Seconds, the Radical Place of *Jupiter* for the Year 1721, be taken 8 Signs, 7 Degrees, 17 Minutes, 38 Seconds, the mean Motion of *Jupiter* in 20 Years, the remainder 10 Signs, 17 Degrees, 9 Minutes, 13 Seconds, will give the Radical Place of *Jupiter* for the Year 1701, and if to 6 Signs, 24 Degrees, 26 Minutes, 51 Seconds, the Radical Place for the Year 1721, be added 8 Signs, 7 Degrees, 17 Minutes, 38 Seconds, the mean Motion for 20 Years, the Sum 3 Signs, 1 Degree, 44 Minutes, 29 Seconds, will give the Radical Place of *Jupiter* for the Year 1741.

Again, if from 6 Signs, 9 Degrees, 59 Minutes, 0 Seconds, the Radical Place of the Aphelion for the Year 1721, be taken 24 Minutes, 0 Seconds, the mean Motion for 20 Years, the Remainder 6 Signs, 9 Degrees, 35 Minutes, 0 Seconds, will give the Radical Place of the Node for the Year 1701, and if to 6 Signs, 9 Degrees, 59 Minutes, 0 Seconds, the Radical Place for the Year 1721, be added 24 Minutes, 0 Seconds, the mean Motion for 20 Years, the Sum 6 Signs, 10 Degrees, 23 Minutes, 0 Seconds, will be the Radical Place of the Aphelion for the Year 1741, and after the same Manner, by adding or substracting, as the Case requires, the mean Motion answering to the Interval of Years between the two given Years, to or from either of them, the Sum or Remainder will give the Radical Place of the Planet and his Aphelion for the other

 Year,

Year, whence the Radical Places of *Jupiter* and his Aphelion being given for any one Year, the Radical Places of the Planet and his Aphelion may be found for any other Year, by the help of the Tables of mean Motions, for common *Julian* Years, and after this Manner, were the 2d, 3d, and 4th Tables constructed.

Table the 7th is a Table of Equations, for reducing the mean Heliocentrick Place of *Jupiter* to the true Heliocentrick Place, and it is greatest when the Planet is near his mean Distance from the Sun, and least or nothing when he is at his greatest and least Distance, and is proportionable to the Distance of the Planet from his Aphelion, or Perihelion, which last is called his mean Anomaly. Now from the mean Anomaly, and his greatest and least Distance of the Planet from the Sun, the proper Equation may be found answering to the given mean Anomaly, may be seen in the First Volume of my System, Page 481, *&c.*

Table the 8th is a Table of the Sun's Place to every Day in the Year 1742, to Minutes only, sufficiently exact for the Use it is here made of, and may serve to 1760, without any sensible Error, and how these Places may be found independently, or by the help of Tables, may be seen in the First Volume of my System, Section the 20th, Page 458, &c.

Tables the 9th, 10th, 11th, and 12th, are Tables of the Equations of Days, for every four Years, shewing the diurnal Difference between the mean and apparent solar Day, and arise from two Causes, *viz.* the Inclination of the Earth's Axis to the Planet of the Ecliptick, and the Excentricity of her Orb, and is a Compound of the two Equations thence arising, as is explained more at large in the 14th Section of my System, Vol. I. where the Manner of computing of them, is shewn and demonstrated.

Table the 13th contains the mean Motions of the four Satellites for common *Julian* Years, as does Tables the 20th, 21st, *&c.* to Tables the 32d, 33d, 34th, inclusive, the mean Motions for Months, Days, Hours, and Minutes, and are formed after the Manner following: The first Satellite is found by Observation, to perform his Revolution in 1 Day, 18 Hours, 27 Minutes, 33 Seconds, 29 Thirds, 50 Fourths, whence to find his mean Motion for one mean Day, you must divide 111974400000, the Product of 86400, the Minutes in one Day or 24 Hours, multiplied into 1296000, the Seconds in a Circle, or 360 Degrees, by 152853.497 the

the Seconds and decimal Parts of a Second, in one Revolution, or 1 Day, 18 Hours, 27 Minutes, 33 Seconds, 29 Thirds, 50 Fourths, and the Quotient 73256.28 Seconds, equal to 6 Signs, 23 Degrees, 29 Minutes, 20 Seconds, 16 1-half Thirds, will be the mean Motion for one Day, or for the first of *January*, whence it's double (rejecting 12 Signs) *viz.* 1 Sign, 16 Degrees, 58 Minutes, 40 Seconds, 33 Thirds, or 1 Sign, 16 Degrees, 58 Minutes, 41 Seconds, will be the mean Motion for two Days, or for the 2d of *January*, it's Triple 8 Signs, 10 Degrees, 28 Minutes, 0 Seconds, 49 Thirds, or 8 Signs, 10 Degrees, 28 Minutes, 1 Second, will be the mean Motion for three Day, or for the 3d Day of *January*, and thus by the continual Addition of one Day's mean Motion, or 6 Signs, 23 Degrees, 29 Minutes, 20 Seconds, 16 1-half Thirds, to the mean Motion for the former Day, and Rejection of 12 Signs, the entire Circumference of the Orb, when the Sum happens to be more than 12 Signs, we shall have the mean Motions of the several successive Days, and consequently for each Day in the common *Julian* Year, the last of which 3 Signs, 23 Degrees, 28 Minutes, 46 Seconds, which corresponds with the last Day of the Year, or the 31st Day of *December*, will be the mean Motion for one common Year, and over and above 6 Signs, 23 Degrees, 29 Minutes, 20 Seconds, the mean Motion for one Day, because the Leap-Year consists of 366 Days, the Sum of these three Numbers, *viz.* 9 Signs, 27 Degrees, 24 Minutes, 24 Seconds, will be the mean Motions for four Years.

The mean Motion for four Years being thus obtained, it's double will give the mean Motion for eight Years, it's Triple will give the mean Motion for 12 Years, it's Quadruple will give the mean Motion for 16 Years, and it's Quintuple the mean Motion for 20 Years.

The mean Motion for 20 Years being doubled, tripled, quadrupled, and quintupled, will give the mean Motions for 40, 60, 80, and 100 Years; and these again being multiplied by 2, 3, 4, 5, &c. will give the mean Motion for 200, 300, 400, 500, &c. Years, and at the same Manner may the Table be carried as high as you please.

The mean Motions for the Multiples of 4 Years being thus found, the mean Motions for the intermediate Years may be found by the Addition of those already made, thus by the Addition of 1 Year's

Motion to 4 Year's Motion, you will have the mean Motion for 5 Years, by the Addition of 2, you will have for 6 Years, by the Addition of 3; for 7 Years, by the Addition of 4, for 8 Years, by the Addition of 5, for 9 Years, &c.

Again, If 6 Signs, 23 Degrees, 29 Minutes, 20 Seconds, the mean Motion for one Day, be divided by 24, the Hours in one Day, the Quotient 8 Degrees, 28 Minutes, 43 Seconds, 20 Thirds, will be the mean Motion for 1 Hour and it's 1-60th Part, *viz.* 8 Minutes, 28 Seconds, 43 Thirds, 20 Fourths, will be the mean Motion for 1 Minute and the 1-60th Part of the Arch, *viz.* 8 Seconds, 28 Thirds, 43 Fourths, 20 Fifths, will be the mean Motion for one Second of Time, &c.

These several mean Motions for one Hour, one Minute, and one Second, being doubled, tripled, quadrupled, &c. will give the mean Motions for two, three, four, &c. Hours, Minutes, Seconds, &c.

The second Satellite performs his Revolution in 3 Days, 13 Hours, 13 Minutes, 41 Seconds, 54 Thirds, 26 Fourths. If therefore the former Product 111,974,400,000, arising from the Multiplication 86400, the Seconds in one Day, or 24 Hours, into 1296000, the Seconds in the Circumference of the Circle, the Product 364949.17 Seconds, equal to 3 Signs, 11 Degrees, 22 Minutes, 29 Seconds, 10 Thirds, will be the mean Motion of the second Satellite for one Day, and for the first Day of *January*; and this being continually added to itself, will produce, after 365 Addition, (rejecting 12 Signs or an entire Circle, when it happens to be more) 9 Signs, 11 Degrees, 47 Minutes, 56 Seconds, the mean Motion for the 31st Day of *December*, the mean Motion for one common *Julian* Year, which Number stands against one Year in the 13th Table, intituled, *A Table*, &c. This again being doubled, tripled, &c. as in the former Example of the first Satellite, will give the mean Motion for 1, 2, and 3 Years, &c. and the mean Motion for one Day being divided by 24, and that Product again by 60, &c. will give the mean Motion for Hours, Minutes, &c.

The third Satellite finishes his Revolution in 7 Days, 3 Hours, 42 Minutes, 33 Seconds, 23 Thirds, 22 Fourths, wherefore, if the former Product 111,974,400,000, be divided by 61815339, the Seconds and decimal Parts of a Second, in 7 Days, 3 Hours, 43 Minutes, &c. the Quotient 18.114.339, equal to 1 Sign, 20 Degrees, 19 Minutes, 3 Seconds, 23 Thirds, will give the mean Motion

Motion for one Day, where by the former Methods of proceeding, the mean Motion for one Year will be 0 Signs, 5 Degrees, 56 Minutes, 10 Seconds, for 4 Years, 2 Signs, 14 Degrees, 3 Minutes, 43 Seconds, for 20 Years, 0 Signs, 10 Degrees, 18 Minutes, 35 Seconds, for 100 Years, 1 Sign, 21 Degrees, 32 Minutes, 55 Seconds, *&c.*

The fourth Satellite performs his Revolution in 16 Days, 16 Hours, 32 Minutes, 7 Seconds, 47 Thirds, 50 Fourths, whence his mean Motion for one Day will be found to be 0 Signs, 21 Degrees, 34 Minutes, 16 Seconds, 2 Thirds, for one Year 10 Signs, 13 Degrees, 27 Minutes, 22 Seconds, for 100 Years 6 Signs, 24 Degrees, 53 Minutes, 20 Seconds, &c. by the former Methods of Investigation.

By the help of the 13th Table, containing the mean Motions of the Satellites for common *Julian* Years, and the mean Place of the Satellite at any Time given, may the 17th, 18th, and 19th Tables, containing the Radical Places of the Satellites for the present Century be constructed, *viz.* by adding or substracting the mean Motions for the intermediate Years, &c. as the Case requires, to or from the mean Place given, and the Sum or Difference thence resulting, will give the Radical Places for the required *ex. gr.* Suppose the Radical Place of the first Satellite for the first Year of Christ to be 7 Signs, 16 Degrees, 40 Minutes, 2 Seconds; if to this we add 1 Sign, 7 Degrees, 50 Minutes, the mean Motion for 1700 Years, (made up of the Motions of 1000 Years, 600 Years, and 100 Years, taken out of the 13th Table) the Sum 8 Signs, 24 Degrees, 30 Minutes, 2 Seconds, will be the Radical Place of the Satellite for the Year 1701, to which, if 3 Signs, 4 Degrees, 4 Minutes, the mean Motion for 40 Years, be added, the Sum 11 Signs, 28 Degrees, 34 Minutes, 2 Seconds, will be the Radical Place for the Year 1741; and again, if to this we add 4 Signs, 21 Degrees, 6 Minutes, the mean Motion for 60 Years, the Sum 4 Signs, 19 Degrees, 40 Minutes, 2 Seconds, will be the Radical Place of the Satellite for the Year 1801, after the same Manner, by adding or substracting, as the Case requires, the mean Motions answering to any greater or lesser Interval of Years, to any assigned Radical Place, you will have the Radical Places of the Satellite to the Time proposed; and by a like Method of Investigation may the Radical Places of the other three Satellites be found.

The Radical Places in the 14th, 15th, and 16th Tables, are formed by the Addition of the mean Motion of 8 Minutes, 45 Seconds, of each of the four Satellites, to the respective Radical Place in the 17th, 18th, and 19th Tables, thus by adding 1 Degree, 14 Minutes, 11 Seconds, the mean Motion of the first Satellite in 8 Minutes, 45 Seconds of Time, to 11 Signs, 20 Degrees, 42 Minutes, 46 Seconds, the Radical Place of the first Satellite, in the 17th Table, for the Year 1735, you will have 11 Signs, 21 Degrees, 56 Minutes, 57 Seconds, for the Radical Place of the first Satellite for the same Year, in the 14th Table, in like Manner, by adding 36 Minutes, 57 Seconds, the mean Motion of the second Satellite, in 8 Minutes, 45 Seconds of Time, to 11 Signs, 11 Degrees, 55 Minutes, 6 Seconds, the Radical Place of the Satellite in the 14th Table, standing against the Year 1735, you have 11 Signs, 12 Degrees, 32 Minutes, 3 Seconds, for the mean Motion standing against the Year 1735, in the 14th Table. Again, if to 8 Signs, 6 Degrees, 49 Minutes, 26 Seconds, the Radical Place of the third Satellite, for the Year 1735, in the 17th Table, be added 18 Minutes, 20 Seconds, the mean Motion of the third Satellite, in 8 Minutes, 46 Seconds, the Sum 8 Signs, 7 Degrees, 7 Minutes, 46 Seconds, will be the Radical Place of the Satellite for the Year 1735, in the 14th Table; and lastly, if to 2 Signs, 28 Degrees, 4 Minutes, 12 Seconds, in the Radical Place of the fourth Satellite in the 17th Table, be added 7 Minutes, 51 Seconds, the mean Motion of the Satellite, in 8 Minutes, 45 Seconds, the Sum 2 Signs, 28 Degrees, 12 Minutes, 3 Seconds, will be the Radical Place of the fourth Satellite, in the 14th Table, for the Year 1735, and thus by the Help of the Radical Place on one Table, may the Radical Place in the other Table be found for every single Year, and after this Manner may the Tables be formed.

Tables the 35th and 36th, shew the Difference of Velocities of *Jupiter* and his Satellites, in Days, Hours, Minutes, Seconds, &c. by the Help of which, the Time that the Satellite will require to overtake *Jupiter*, at any given Distance from him, may be readily found, and they may be constructed after this Manner.

The first Satellite is 1 Day, 18 Hours, 27 Minutes, 33 Seconds, performing his Revolution round his Orb, during which Time *Jupiter*, by mean Motion, is advanced 8 Minutes, 48 Seconds, 44 Thirds; now to find how long the Satellite will require to overtake him,

him, we must Reason thus, If *Jupiter* requires 1 Sign, 18 Degrees, 27 Minutes, 33 Seconds, to move over the entire Circumference of his Orb, or 12 Signs, how long Time will he require to move 8 Minutes, 48 Seconds, 44 Thirds, this by the common Rule of Proportion, will be found to be 1 Minute, 2 Seconds, 20 Thirds, which being added to 1 Day, 18 Hours, 27 Minutes, 33 Seconds, will give 1 Day, 18 Hours, 28 Minutes, 35 Seconds, 20 Thirds, for the Synodical Revolution or Time that the Satellite requires to pass from the Conjunction or Opposition, till it arrives at the next Conjunction or Opposition, and this Revolution divided by 12, will give 3 Hours, 32 Minutes, 22 Seconds, 56 Thirds, or 3 Hours, 22 Minutes, 23 Seconds, for the Time that the Satellite requires to get the Distance of one Sign from *Jupiter*, or to overtake him at the same Distance, this being doubled, will give 7 Hours, 4 Minutes, 46 Seconds, for the Time that it will require to gain 2 Signs, and being tripled, will give 10 Hours, 37 Minutes, 9 Seconds, for the Time it will require to get at the Distance of 3 Signs.

Again, if 3 Hours, 32 Minutes, 22 Seconds, 56 Thirds, the Time the Satellite requires to get at the Distance of one Sign from *Jupiter*, be divided by 30, the Degrees in one Sign, the Quotient, 7 Minutes, 4 Seconds, 46 Thirds, or 7 Minutes, 5 Seconds, will be the Time that the Satellite will require to gain one Degree, and it's 1-60th Part 7 Seconds, 5 Thirds, will be the Time that it will require to gain 1 Minute, &c. and each of these being doubled, will give 14 Minutes, 10 Seconds, for the Time that the Satellite will require to gain 2 Degrees, as will 14 Seconds, 10 Thirds, be the Time that the Satellite will require to gain 2 Minutes of Distance, and thus by the continual Addition of the Time that the Satellite requires to gain one Sign, in the Table of Signs, of one Degree, Minute, &c. in the Tables of Degrees, Minutes, &c. you will have the first Column in the Tables of Time, &c. for the first Satellite.

By the same Method of Investigation, it will be found, that the second Satellite will require 3 Days, 13 Hours, 17 Minutes, 53 Seconds, to pass from one Conjunction or Opposition to another, 7 Hours, 6 Minutes, 29 Seconds, to gain 1 Degree, 14 Minutes, 13 Seconds, to gain one Minute, &c. in like Manner the third will, 7 Days, 3 Hours, 59 Minutes, 37 Seconds, for it's Synodical

dical Revolution, 14 Hours, 19 Minutes, 58 Seconds, to gain one Sign, 28 Minutes, 40 Seconds, to gain one Degree; and the fourth, 16 Days, 18 Hours, 5 Minutes, 4 Seconds, for his Period of Eclipses, according to the mean Motion 1 Day, 9 Hours, 30 Minutes, 25 Seconds, to gain 1 Sign, 1 Hour, 7 Minutes, 1 Second, to gain one Degree, &c. whence the several intermediate Motions may be found by the Addition of the Numbers already found, and the Tables compleated.

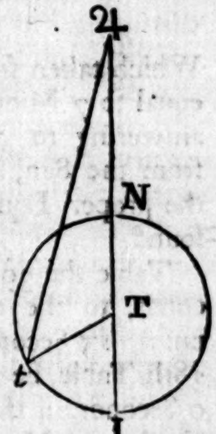
Table the 37th, contains the Equation of Light to every Degree of Distance of the Heliocentrick Place of *Jupiter*, from the Place of the Sun, or Angle of Commutation, *Jupiter* being supposed in the Perihelion, and is founded upon the progressive Motion of Light, which is found by the best Observations to require 7 Minutes to pass from the Sun to the Earth.

The greatest Distance of *Jupiter* from the Sun, is found by Observation, to be $38\frac{81624}{100000}$ such Parts, as the mean Distance of the Earth from the Sun is 7.0000, and the least Distance of *Jupiter* from the Sun, to be $34\frac{65056}{1000000}$ of the same Parts, whence it follows that Light will require 38 Minutes, 9 Seconds, 44 Thirds, to pass over the Aphelion Distance of *Jupiter*, and but 34 Minutes, 39 Seconds, 2 Thirds, to pass the Perihelion Distance; and consequently the Difference, 3 Minutes, 30 Seconds, 42 Thirds, is the Time that it requires to pass a Space equal to the Excentricity, from whence arises one Part of the Equation of Light, and is the Basis upon which the 39th and 40th Tables are founded, as shall be explained hereafter.

Now if to 34,65056, the Perihelion Distance of *Jupiter*, be added 7.0000, the mean Distance of the Earth from the Sun, the Sum 41.650056, equal to 41 Minutes, 39 Seconds, is the Time that Light requires to pass from *Jupiter* to the Earth, at the Time of the Conjunction, *Jupiter* being supposed in the Perihelion; and if from the same Perihelion Distance 36.6505667, be substracted 7.0000, the Semidiameter of the Earth's Orb, the Remainder 27.650056, equal to 27 Minutes, 39 Seconds, is the Time that Light requires to pass from *Jupiter* to the Earth, at the Time of the Opposition, and their Difference 14 Minutes, is the Time that Light requires to pass over a Space equal to the Diameter of the great Orb; and hence arises another Part of the Equation of Light, and the Compound arising from these two Causes, is the absolute Equation of Light.

The

The mean Diſtance of *Jupiter* is 36.40644, whence Light will require 36 Minutes, 24 Seconds, 23 Thirds, to paſs over a Space equal to the mean Diſtance, this taken from 41 Minutes, 39 Seconds, the Time that Light requires to paſs from the Perihelion to the Earth, at the Time of the Conjunction, will give 5 Minutes, 14 Seconds, 37 Thirds, or 5 Minutes, 15 Seconds, the greateſt Equation affirmative, which anſwers to 0 Signs, 0 Degrees, 0 Minutes, in the 38th Table; and if from 36 Minutes, 24 Seconds, 23 Thirds, the Time that Light requires to paſs the mean Diſtance, be taken 27 Minutes, 39 Seconds, the Time that Light requires to paſs from the Perihelion to the Earth, at the Time of the Oppoſition, the Remainder 8 Minutes, 45 Seconds, 23 Thirds, or 8 Minutes, 45 Seconds, will be the greateſt Equation negative, which ſtands againſt 6 Signs, 0 Degrees, 0 Minutes, in the ſame Table; and to find how long Time it will require to paſs from *Jupiter* to the Earth, at any intermediate Diſtance. In the Triangle ♃ T *t* are given ♃ *t*, the Diſtance of *Jupiter* from the Sun, at the Perihelion 34.65056, T *t* the mean Diſtance of the Sun from the Earth 700000, and the Angle *t* T I, or *t* T ♃, the Diſtance of the Earth from the Oppoſition or Conjunction, which we will ſuppoſe 1 Sign, or 30 Degrees, 0 Minutes, whence to find the Angle *t* ♃ T, it will ♃ T + T *t* : ♃ T — *t* T : : *t*, 1-half *t* T I : *t*, half ♃ *t* T — *t* ♃ T, but ♃ T + (*t* T =) T I = ♃ I, and ♃ T — (*t* T =) T N = ♃ N, wherefore as ♃ I, the greateſt Diſtance of the Earth from *Jupiter* (*Jupiter* being ſuppoſed in the Perihelion) is to ♃ N, the leaſt Diſtance, ſo is the Tangent of half the Angle of Commutation, to the Tangent of an Arch, which being taken from the half Commutation, will give the Angle *t* ♃ T the Parallactic Angle, then as the Sine of the Parallactic Angle, to the Sine of the Commutation, ſo is the Earth's mean Diſtance from the Sun to her Diſtance from *Jupiter* at that Time, that is,



As ♃ T + *t* T = 44.65056 — — — — 1.6196671

To ♃ T — *t* T = 27.65056 — — — — 1.4417737
So is the Tangent of 70 Degrees — — — 10.5719475

To the Tangent of 68.01.16 — — — 10.3940541

Now 75 Degrees, 0 Minutes, — 68 Degrees, 1 Minute, 16 Seconds = 6 Degrees, 58 Minutes, 44 Seconds, = ∠ *t* ♃ T.

As the Sine of T ♃ = 6.58.44 — — — 9.0845884

To the Sine of *t* T I = 30.00.00 — — 9.6989700
So is T *t* = 7.00000 — — — — 0.8450980

To ♃ *t* = 28.8057 — — — — 1.4594796

Which taken from the mean Distance, 36.4000, will leave 7.5943, equal to 7 Minutes, 33 Seconds negative for the Equation of Light, answering to 5 or 7 Signs of the Geocentrick Place of *Jupiter* from the Sun, in the 38th Table, and after the same Manner may the proper Equation, answering to any other given Distance be found.

Table the 39th is formed by the Addition of 8 Minutes, 45 Seconds, to the correspondent Equation in Table 38, thus if 5 Minutes, 15 Seconds +, standing under 0 Signs, 0 Degrees, in the 38th Table, be added 8 Minutes 45 Seconds, the Sum 14 Minutes, 0 Seconds, is the Equation, standing under 0 Signs in the 39th Table thus, 4 Minutes, 27 Seconds, + 8 Minutes, 45 Seconds, under 1 Sign, equal to 13 Minutes, 12 Seconds, is the Equation of Light, answering to 1 Sign in the 38th Table, — 4 Minutes, 39 Seconds, the Equation of Light answering to 4 Seconds, or 8 Seconds, in the 38th Table, + 8 Minutes, 45 Seconds, will give 4 Minutes, 6 Seconds + for the Equation of Light in the 39th Table.

N. B. Table the 39th is to be used with the Radical Places, in Table the 14th, 15th, 16th, as the 38th Table of Equation of Light is to be used with the Radical Places, in the 17th, 18th, and 19th Tables.

In

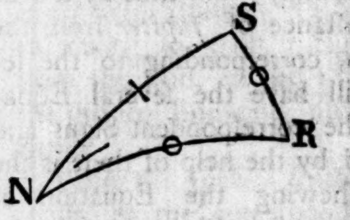
In the preceding Computations *Jupiter* has been ſuppoſed fixed in the Perihelion, but as *Jupiter* himſelf moves through his Orb at the ſame Time, by which Means his Diſtance from the Sun is conſtantly changing; hence ariſes another Equation, which when it is greateſt, is 3 Minutes, 30 Seconds, as has been ſhewn already, and it's ſeveral Variations, according to the different Diſtance of *Jupiter* from the Earth, are contained in the 40th and 41ſt Tables, which are formed after the Manner following.

The greateſt Diſtance of *Jupiter* from the Sun, is 38.1624, ſuch Parts as the mean Diſtance of the Earth from the Sun is 7.00000, but as *Jupiter* recedes from the Aphelion, it grows leſs and leſs, till when it arrives at the Perihelion, it is but 34.6506 of the ſame Parts, and the Difference between 1 or 11 Signs of mean Anomaly. Again, if from 37.331, the Diſtance of the Sun from *Jupiter*, at 2 Signs or 10 Signs of mean Anomaly, be taken the ſame Perihelion Diſtance 34.650, the Remainder 2.681 = 2 Minutes, 40 Seconds, 51 Thirds, or 2 Minutes, 41 Seconds, will be the proper Equation anſwering to 2 or 10 Signs of mean Anomaly; and thus by a continual Subſtraction of the Perihelion Diſtance of *Jupiter* from the ſeveral Diſtances of *Jupiter* from the Sun, correſponding to the ſeveral Degrees of mean Anomaly, you will have the ſeveral Equations in Table the 41ſt, anſwering to the correſpondent Signs and Degrees of *Jupiter's* mean Anomaly, and by the help of theſe is the 40th Table of Increments, formed ſhewing the Equation of Light to every Degree of *Jupiter's* Heliocentrick Place, by placing the greateſt Equation in 6 Signs, 10 Degrees, the Place of *Jupiter's* Aphelion about the preſent Time. As this Table itſelf may be formed by the finding the different Diſtances of *Jupiter* from the Sun, correſponding to the ſeveral given Geocentrick Places of *Jupiter*.

Inſtead of placing *Jupiter* in the Perihelion, which was neceſſary to ſhew the Conſtruction of the 38th and 39th Tables, if we ſuppoſe him placed at his true Diſtance from the Sun, which may be found in the Tables of his Motion, then will ♃ ☉ 3.5118 equal to 3 Minutes, 30 Seconds, be the greateſt Equation; and conſequently it is greater or leſſer, according as the Sun is at a greater or leſſer Diſtant from the Aphelion, and is therefore proportional to the mean Anomaly of *Jupiter*, by which the various Diſtances are found, ſo that if from the Diſtance of *Jupiter* from the Sun, anſwering to any

any Degree of mean Anomaly, be taken the Perehelion Diſtance of *Jupiter*, the Remainder will be the correſpondent Equation; for Example, the Diſtance of *Jupiter* from the Sun at one Sign of mean Anomaly 37.933, ſuch Part as the Earth's mean Diſtance is 7.0000; whence if from 37.933, be taken 34.650, the Perihelion, or leaſt Diſtance, the Remainder 3.283, equal to 3 Minutes, 17 Seconds, will be the proper Equation, anſwering the Diſtance of the Earth from *Jupiter*, be the true Diſtance at that Time, and it's Difference from the mean Diſtance of *Jupiter* from the Sun, will be the true and abſolute Equation of Light at that Time; which if the Diſtance of the Earth from *Jupiter* be more, then the mean Diſtance will be poſitive; but if it be leſs than the mean Diſtance, the Equation will be negative, and muſt be ſubſtracted.

The 49th Table contains the Latitude of the firſt Satellite and it's Reduction, to every Degree of Diſtance of the Satellite from it's Node, the Inclination of it's Orb to the Orb of Jupiter, or it's greateſt Heliocentrick Latitude, being 2 Degrees, 55 Minutes, whence to find the Latitude, and the Reduction at any given Diſtance from the Node, in the right-angled Spherical Triangle N S R, right-angled at R, (where N S repreſents a Part of the Orb of the Satellite, N R a Part of Jupiter's Orb, N the Node, and the Angle SNR, the Inclination, or greateſt Latitude) are given N S, the Diſtance of the Satellite from it's Node, or Argument of Latitude, and the Angle SNR, it's greateſt Latitude, whence to find S R, it's preſent Latitude, it will be by the Rules of Spherical Triangles, as R : S ∠N : : S, N S : S, S R.



Let us now ſuppoſe the Satellite at the Diſtance of 2 Signs, or 60 Degrees, from the Node, then to find it's preſent Latitude, it will be

As the Radius — — — —	10.0000000
To the Sine of the Inclination, 2 D. 55 M. — —	8.7065766
So is the Sine of the Diſtance from the Node, 60 D.	9.9375306
To the Sine of the preſent Lat. 2 D. 31 M. 32 S. —	8.6441072

Which

Which if the Argument of Latitude, or Distance of the Satellite from the Node, be less than 6 Signs, is North, but if it be more than six Signs, the Latitude is South.

Again, To find the Reduction in the same Triangle N S R, the same Things being given as before, to find N R it will be as R :. Cs L N : : t N S : t N R.

As the Radius	10.0000000
To the Cosine of the Inclination, 2 deg. 55 min.	9.9994370
So is the Tangent of the Arg. Lat. 60 deg.	10.2385606
To the Tang. of Long. in Eclipt. 59 d. 58 m. 4 s.	10.2379976

Which taken from the Argument of Latitude, 60 Degrees, 0 Minutes, will leave 0 Degrees, 1 Minute, 56 Seconds, for the present Reduction, which if the Satellite be in the first or third Quadrant, that is, if the Argument of Latitude be less than 3 Signs, or more than 6, and less than 9 Signs, is negative, and must be substracted; but if the Satellite be in the 2d or 4th Quadrant, that is, if the Argument of Latitude be between 3 and 6 Signs, or between 9 and 12 Signs, it is affirmative, and must be added, and after the same Manner may the present Latitude and Reduction be found at any other Distance of the Satellite from it's Node, and the Table compleated.

By the same Method of Investigation may the Latitude and Reductions of the other three Satellites be found, the Inclinations of their Orbs to the Orb of *Jupiter*, or their greatest Latitudes being given.

Table the 46th, is a Table of Equations for reducing the mean Place of the 4th Satellite, to the true Place his greatest Distance from *Jupiter* to his least, being nearly as 1341 to 1322, whence the greatest Equation will be 48 Minutes, 0 Seconds, and how from thence to find the several Equations answering to the several Distances of the Satellites from his Apsides, may be seen in my System, Vol. the Ist, Section the 20th, Page 476, &c.

Table the 47th, Contains the apparent Distances of the Satellites from the Center of *Jupiter*, in Semidiameters of *Jupiter*, and hundred Parts, to every Degree of Distance, if the Satellites from *Jupiter*'s Geocentrick Place, and according to the Laws of Orthogra-

phick Projection, those Distances will be as the Sines of their respective Distances from *Jupiter*; whence from the greatest Elongation, to find the several Distances, it will be,

As the Radius to the Sine of the Distance of the Satellites from the Geocentrick Conjunction, so is the greatest Elongation to the apparent Distance.

EXAMPLE.

Let it be required to find the apparent Distance of the Fourth Satellite, his greatest Elongation being 25.64 and his Distance from the Conjunction 2 Signs, or 60 Degrees. Wherefore,

As the Radius	10.0000000
To the Sign of 60.00	9.9375306
So is the greatest Elongation 25.64	1.4089180
To the present Elongation 22.21	1.3464486

After the same Manner may the Elongation at any other Distance of the Satellite, from it's Geocentrick Conjunction be found, as also the Elongations of any other of the three Satellites at any given Time, their greatest Elongation being given.

Tables the 42d, 43d, 44th, and 45th, Contain the Semiduration of the Eclipses of the Four Satellites, and how they may be found, has been shewn in Problem the third, Page the 11th, preceding the Tables.

HOW near these Tables agree with the Heavens, or which is the same thing, to what Degree of Exactness they may be depended upon, may be seen in the succeeding Collection of Observations, which were all communicated to me by my Friends and Foreign Correspondents, particularly Father *Pedrini*, at *Pekin* in *China*, as may be seen from Time to Time in the *Philosophical Transactions*, and by them it appears, that by comparing 244 Eclipses of the first Satellite, observed between the Years 1670, and 1730; that there are 74, which is near one third of the whole Number, that do not err one Minute from the Time of Observation; that there are 127, which is above one half, that do not err two

two Minutes; that there are 181, which is two thirds of the whole Number, that do not err three Minutes; and 214, which is ſeven eighths of the whole, that do not differ four Minutes from the Tables, which is a Degree of Exactneſs ſufficient, in my Opinion, to recommend the Uſe of theſe Eclipſes to our Navigators, eſpecially ſince they may be ſeen with a Teleſcope of three Foot, as is aſſerted in Page 174, of the *Connoiſſance Des Temps* for the preſent Year; and if this be true, I will venture to affirm, that an Immerſion or Emerſion, obſerved with a ſmall Glaſs, will not differ one Minute from the Time obſerved, with the largeſt Glaſſes; however that be, it is but comparing an Obſervation, made with theſe two Glaſſes, of the ſame Eclipſe together, and the Difference between the Times will be diſcovered, which will ſerve for ever afterwards, to adjuſt the Obſervations made by them.

Although the Times of the Immerſions and Emerſions of the Second, Third, and Fourth Satellites, do not anſwer ſo near to the Obſervations, as could be wiſhed for, yet in their Turns they contribute to aſcertain the Longitudes of Places very exactly, for if two or more People obſerve the ſame Immerſion or Emerſion of the ſame Satellite in different Places, the Difference of the Times at the ſeveral Places, where the Obſervations are made, will give the Difference of Longitudes between thoſe ſeveral Places; but if it ſhould ſo happen, that two or more Perſons ſhould not ſee the ſame Immerſion or Emerſion at the ſame Time, yet the Synodical Periods are ſo well adjuſted, that if they ſhall obſerve an Immerſion or Emerſion of the ſame Satellite, at ſome Time after, provided the Interval of Time be not too great, the Time when the Immerſion or Emerſion happened, may be readily and exactly found, to all Intents and Purpoſes, and this is common to all the Satellites.

In the Obſervation of Eclipſes, in order to prevent any Miſtake that may ariſe, from taking one Satellite for another, as well as to point out the exact Place where the Satellite will appear, at the Time of it's Immerſion or Emerſion, for want of a Knowledge of which the Satellite may be emerged ſome Time before it is diſcovered, and immerged before it is miſſed, it is uſual for the Obſerver to exhibit their Appearances at the Time of the Eclipſe, and how this may be done, may be ſeen in Pages 85 and 86, but for the Benefit of ſuch Perſons, who have not this Advantage, I ſhall endeavour to give them ſuch Inſtructions, which if well obſerved, will not only point out the

the exact Point in the Heavens, where the Appearance will be visible, but will prevent them from taking one Satellite for another.

And first, the Observer must take Notice, that from the Time of the Conjunction of *Jupiter* to the Sun, to the Time of the Opposition, the Eclipses in general will be visible on the West Side, or on the Right-Hand of *Jupiter*, when viewed in the Heavens, and at the Time of the first Quadrature, when the first Satellite will immerge into the Shadow of *Jupiter*, at the Distance almost of two Semidiameters of *Jupiter*, from the Center of *Jupiter*'s Body, the second Satellite will immerge at the Distance of two Semidiameters and an half, and the third at the Distance of three Semidiameters and a Quarter; and as the Earth hastens to the Opposition, the Distance of each Satellite, at the Time of the Eclipse, will be less and less distant from the Body of *Jupiter*, till when the Earth arrives at the Opposition, the Satellite will immerge close to the Limb of *Jupiter*, and this Diminution or Decrease of Distance, will be so regular, that the Spectator, by allowing for the proportional Part of Time, between the Quadrature and the Opposition or Conjunction, (for the Distance of the Satellite from the Body of *Jupiter*, at equal Distances from these Points being the same) I say by these Means the Spectator will be at no Loss to find the exact Point where the Satellite will appear or disappear; and on the contrary, during the Space of Time that the Earth is moving from the Opposition through the second Quadrature to the Conjunction, the Eclipse will be seen on the East Side, or on the Left-Hand of *Jupiter*, viewed from the Earth, and at the same Distances as in the former Case, according as he Approches to the Quadrature from the Opposition, or recedes from it, in going to the Conjunction. By Reason of the great Distance of the third Satellite from *Jupiter*'s Body, for about six Weeks before and after the Quadrature, the Immersions and Emersions become visible on the same Side of his Body, and this without any other, is an ocular Demonstration, that neither *Jupiter*, nor any of his Satellites, have any Light of their own, and none but what they borrow from the Sun.

As the Method of finding in what Places of the Earth an Eclipse of any of the Satellites will be visible by Calculation, is operose and difficult. I shall shew how it may easily be done by the Globe, which in my Opinion is the most natural Way, and is sufficiently exact to all Intents and Purposes.

And

And to this End, let it be required to find all that Space of Earth and Water, where an Eclipse of any one of the Satellites of *Jupiter* will be visible.

1st, Find the Place upon the Earth where the Sun is vertical at the Time of the Eclipse.

2dly, Elevate the Pole that is nearest to the Sun, till it's Height be equal to the Sun's Declination at that Time.

3dly, Bring the Place over which the Sun is vertical, under the Meridian, then if *Jupiter* be in Consequence of the Sun, a Line drawn on the Globe, on the Eastern Side of the Horizon, will pass over all those Places where the Sun is setting at that Time. But if *Jupiter* be in Antecedence of the Sun, draw the Line on the Western Side of the Horizon, and it will shew all those Places where the Sun is then rising.

If *Jupiter* be in Consequence of the Sun, add the Difference between the Right Ascensions of the Sun and *Jupiter* to the Longitude of that Place, where the Sun is vertical at that Time, and bring that Degree of the Equator under the Meridian, and elevate the North Pole, if *Jupiter* be on the North Side of the Equator, but if he be on the Southern Side, elevate the South Pole, till it be equal to the Declination of *Jupiter*; in this Position of the Globe draw a Line along the Eastern Side of the Horizon, the Space between this Line, and the Line that determined the Places where the Sun was setting, will comprehend all those Places of the Earth where *Jupiter* will be visible from the setting of the Sun to the setting of *Jupiter*.

But if *Jupiter* be in Antecedence to the Sun's Substract, the Difference of the Right Ascensions of the Sun and *Jupiter* from the Longitude of the Place where the Sun is vertical, at the Time of the Eclipse, and bring the Degree of the Equator, answering to the Remainder under the Meridian; and the Globe being elevated, as in the former Case, draw a Line by the Western Limb of the Horizon, and Space contained between this Line, and the Line shewing all those Places where the Sun is rising, drawn as before, will comprehend all those Places on the Earth, where the Eclipse is visible between the Times of the rising of the Sun and *Jupiter*.

As I am now upon the Subject of shewing what Helps the Heavens afford us, for finding the Difference of Longitudes of Places,

(a thing of vaſt Importance in Geography and Navigation) I ſhall take the Liberty of making ſome Extracts out of the 16th Section of the Firſt Volume of my Syſtem of the Mathematicks; for as the Book has been out of Print ſome Years, I hope the Reader will be ſo good as to excuſe it, ſince he may meet with ſome Things that may not be unworthy of his Notice.

And in order to give the Reader a juſt and adequate Notion of the Methods here propoſed, it is neceſſary to remind, that the Difference of Longitude, or Arch of the Equator, intercepted between the Meridians, paſſing through the two Places, is analogous to the Quantity of Time, that the Sun requires to move from the Meridian of one Place to the Meridian of another. Wherefore, if two or more Places lie under the ſame Meridian, that the Hour in one Place will be the ſame with the Hour in another; and on the contrary, if in two or more Places the Hour be the ſame, thoſe Places lie under the ſame Meridian.

Now becauſe the Sun in all Places conſtantly riſes in the Eaſt, he muſt neceſſarily apply himſelf to the Meridian of the Eaſtermoſt Place firſt, and conſequently in that Place which lies to the Eaſtermoſt, the Noon happens ſooneſt, and the Hour of the Day, or Diſtance of the Sun from the Meridian at any other Time, muſt be greater. Thus, for Example, becauſe *London* lies 58 Degrees, 15 Minutes, equal in Time to 3 Hours, 13 Minutes, to the Eaſtward of *Barbadoes*. When the Sun is upon the Meridian of *London*, he is 3 Hours, 53 Minutes, ſhort of the Meridian of *Barbadoes*, that is, when it is 12 of the Clock at *London*, it is but ſeven Minutes after Eight in the Forenoon at *Barbadoes*; and on the contrary, becauſe *Barbadoes* lies 58 Degrees, 13 Minutes, or 3 Hours 53 Minutes to the Weſtward of *London*. When the Sun is upon the Meridian of *Barbadoes*, he is 3 Hours, 53 Minutes, paſt the Meridian of *London*, that is, when it is 12 of the Clock at *Barbadoes*, it is 53 Minutes after Three of the Clock in the Afternoon at *London*.

Whence it appears, that if by any Contrivances the Hour of the Day, at the ſame Point of abſolute Time, in two different Places, can be obtained, the Difference of Longitude between thoſe two Places is known alſo; and by comparing the Times together, it is eaſy to pronounce which Place of the two lies to the Eaſtward or Weſtward of the other.

Now

Now since an Eclipse of the Moon arises from nothing else but the Interposition of the Earth between her and the Sun, by which she is prevented from reflecting the Light she receives from the Sun, the Moment that any Part of her Body begins to be deprived of the Solar Rays, it is visible to all those People who can see her at the same Time; whence if two or more different People, at two or more different Places, observe the Time when it first began or ended, or note the Time when any Number of Digits was eclipsed, or when the Shadow begins to cover or quit any remarkable Spot, the Difference of Times, (if there be any) when compared together, will give the Difference of Longitude between the Places of Observation, and of these we have various Instances.

On the 21st of *December*, 1675, at 16 Hours, 7 Minutes, 15 Seconds, Mr *Flamsteed*, at the Royal Observatory at *Greenwich*, observed the End of a Lunar Eclipse; and Mr *Cassini* observed that the End of the same Eclipse happened, at the Royal Observatory at *Paris*, at 16 Hours, 15 Minutes, 25 Seconds; whence the Difference of Times between the two Places of Observation, is 8 Minutes, 10 Seconds, equal to 2 Degrees, 2 Minutes, 30 Seconds. Whence it follows, that since the Sun was removed farther off from the Meridian of *Paris*, than it was from the Meridian of *Greenwich*; or which is the same thing, since it happened later at *Paris* than it did at *Greenwich*, it follows, that *Paris* lies to the Eastward of *Greenwich*, 2 Degrees, 2 Minutes, 30 Seconds, and so much is the Difference of Longitude between those two Places. Again,

On the 11th of *February* 1681-2, Mr *Flamsteed* observed at *Greenwich*, the Beginning of a Lunar Eclipse to happen at 9 Hours, 12 Minutes, 30 Seconds; the Beginning of the same Eclipse was observed at *Lisbon* in *Portugal*, to happen at 8 Hours, 31 Minutes, P. M. whence the Difference of Meridians, or Difference of Longitudes, between *Greenwich* and *Lisbon*, is 41 Minutes and 30 Seconds of Time, answering to 10 Degrees, 22 Minutes, 30 Seconds, *Lisbon* lying so much to the Westward of *Greenwich*.

Now by comparing the Difference of Longitude between *Paris* and *Greenwich*, and between *Greenwich* and *Lisbon*, may the Difference of Longitude between *Paris* and *Lisbon* be determined.

Greenwich lies to the Westward of *Paris* 2 Degrees, 2 Minutes, 30 Seconds; and *Lisbon* lies to the Westward of *Greenwich*, 10 Degrees,

grees, 22 Minutes, 30 Seconds, wherefore *Paris* lies to the Eastward of *Lisbon* 12 Degrees, 25 Minutes.

On the 11th of *December*, 1704, at the *Royal-Exchange* in *London*, it being a little cloudy, I myself observed, as near as possible, that the Moon began to be eclipsed about 4 Hours, 31 Minutes, 30 Seconds in the Morning, and the Beginning of the same Eclipse was observed at *Boston* in *New England*, by Mr *Brattle*, to happen at 49 Minutes after Eleven in the Evening, whence the Difference of Longitude, by their Observation, between *London* and *Boston*, is 4 Hours, 2 Minutes, 30 Seconds, nearly equal to 70 Degrees, 37 Minutes. Again, as near as I could judge, (it being for the most Part cloudy) the End of the same Eclipse happened at *London*, at about 5 Hours, 37 Minutes, 30 Seconds, and this was likewise observed to happen at *Boston*, exactly at 54 Minutes after Twelve, whence by comparing these two Observations together, it appears that the Difference of Longitude amounts to 4 Hours, 43 Minutes, 30 Seconds nearly, or 72 Degrees, 52 Minutes; and by taking the Mean between them, it will be found that the Difference of Longitude between *London* and *Boston*, is 4 Hours, 43 Minutes, or 70 Degrees, 45 Minutes, *Boston* lying so much to the Westward of *London*.

One Reason of the Difference between the Beginning and the End, was occasioned by the Badness of the Weather at *London*, it being so cloudy for the most Part, that no Body besides myself saw it in or near *London*; however, as the same Difference of Longitude has since been found, by comparing other Observations together, there is no room left to doubt of the Truth of it.

The Longitudes of Places may also be determined from Solar Eclipses, but these being incumbered with the Considerations of Parallaxes, and happening but rarely, have not much been taken Notice of.

Among the many Observations that have been made for determining the Difference of Longitudes of Places, by the Eclipses of *Jupiter*'s Satellites, I have extracted the following out of the *Philosophical Transactions*, No. 177, *Anno* 1680, *October* 3, O. S. *Signior Joseph Panthea*, and *Marcho Antonio Celio*, observed the Total Immersion of the First Satellite into the Shadow of *Jupiter* at *Rome*, at 10 Hours, 7 Minutes, 53 Seconds, P. M. which Immersion was also observed by Mr *Flamsteed*, at the Royal Obser-

vatory

vatory at *Greenwich*, to happen at 9 Hours, 15 Minutes, 41 Seconds, whence the Difference of Meridians between *Rome* and *Greenwich*, is 52 Minutes, 12 Seconds in Time, answering to 13 Degrees, 3 Minutes, *Rome* lying so much to the Eastward of *Greenwich*, and as an Instance of the Exactness of the Tables for the First Satellite, I need only mention an Observation of *Signior Francis Blanchini*, made at *Rome* in the Year 1685, when on the 18th of *January*, he observed the total Immersion of the First Satellite, at 11 Hours, 19 Minutes, 45 Seconds, which by the Tables happened at *Greenwich*, at 10 Hours, 27 Minutes, 25 Seconds, whence the Difference of Meridians between *Rome* and *Greenwich* is 52 Minutes, 13 Seconds, answering to 13 Degrees, 3 Minutes, 15 Seconds, agreeing very well with the former Deductions.

Besides these, there is another Method equally useful, expeditious, and certain, and that is the Appulses of the Moon to certain fixed Stars, or their Occultations, by the Interposition of her Body, for the Moon finishing her Revolution in the Space of 27 Days, 7 Hours, 43 Minutes, there are but few clear Nights, when the Moon does not pass over, or so near to some fixed Star, that their Distance from it, or the Time of her visible Conjunction with it, may be easily observed by the Telescope and Micrometer only, and these when compared together, or with the visible Time computed to the Meridian of some Place, when a good Theory of the Moon shall be obtained, will shew the Difference of Longitudes of those Places. An Instance of the Use of this Method we have in the Determination of the Difference of Longitude, between *London* and *Ballasore* in *India*, as follows.

On the 28th of *October*, 1680, at 8 Hours, 6 Minutes, an Immersion of the Bulls Eye Aldebaran, was observed at *London*, when the true Place of the Moon, corrected by *Parallax*, was *Gemini*, 4 Degrees, 32 Minutes, 24 Seconds, but at *Ballasore* Road (in the Latitude of 21 Degrees, 21 Minutes North, and about 20 Miles East South East from the Town) the true Place of the Moon, was *Gemini*, 5 Degrees, 54 Minutes, that is, 1 Degree, 21 Minutes, 36 Seconds, more than at 8 Hours, 6 Minutes at *London*, now according to the Moon's Velocity at that Time, she passeth an Arch of 1 Degree, 21 Minutes, 36 Seconds, in 2 Hours, 8 Minutes, 40 Seconds, of Time, so then at 10 Hours, 14 Minutes, 40 Seconds at *London*, the Moon was in the same Place, as at 16 Hours, 0 Minutes,

nutes, at *Ballasore* Road, whence the Difference of Longitude will be 5 Hours, 45 Minutes, 20 Seconds in Time, answering to 86 Degrees, 20 Minutes, *Ballasore* Road being so much to the Eastward of *London*.

Again, on the 22d of *December*, 1680, an Immersion of Aldeharan, the Bull's Eye was found by Calculation, to be at 14 Hours, 49 Minutes, at *Ballasore*, the Moon's true Place was *Gemini*, 6 Degrees, 30 Minutes, 30 Seconds, and at 7 Hours, 46 Minutes, 12 Seconds, the correct Time of the Immersion at *Dantzick*, the Moon's true Place was *Gemini*, 4 Degrees, 55 Minutes, 11 Seconds, that is, 1 Degree, 35 Minutes, 20 Seconds, short of the Place, deduced from the Observation made at *Ballasore* Road, and consequently the Difference of Longitude between *Dantzick* and *Ballasore* Road, will be 4 Hours, 30 Minutes, 8 Seconds, equal to 67 Degrees, 32 Minutes, *Ballasore* Road lying so much to the Eastward of *Dantzick*.

Dantzick lies 1 Hour, 15 Minutes, 30 Seconds, more Easterly than *London*, wherefore *Ballasore* Road, by this Observation, lies 5 Hours, 45 Minutes, 38 Seconds, equal to 86 Degrees, 24 Minutes, to the Eastward of *London*, agreeing within 4 Minutes of the former Deduction, which in that Distance is next to nothing.

And as a farther Confirmation hereof, Mr *Benjamin Haris* being ashore at *Ballasore* Town, he observed with great Care and Exactness, on *November* the 18th, 1680, that at 9 Hours, 13 Minutes, the Star which *Tycho Brabe* calls in *Cotyla dextra Aquaris duarum præcedens*, and (which was then in *Aquarius* 28 Degrees, 32 Minutes, having 2 Degrees, 46 Minutes, North Latitude) was in a right Line with the Cusp of the Moon, she being then near the first Quarter, the Moon's Place at that Time by the Horroecian Theory, viz. at 2 Hours, 53 Minutes at *London*, is found *Aquarius*, 29 Degrees, 41 Minutes, 17 Seconds, that is, 19 Minutes, 7 Seconds, more than at *London*, which in Time gives 36 Minutes, so that 3 Hours, 29 Minutes at *London*, was 9 Hours, 13 Minutes, at *Ballasore* Town, whence the Difference of Longitude is 5 Hours, 44 Minutes, or 86 Degrees, 0 Minutes, agreeing exactly with the first Deduction.

The same may be done from the Immersion and Emersions of any of the Planets, from behind the Body of the Sun or Moon, as Monsieur *Cassini* pronounced the Difference of Longitude between

Canton in *China* and *Paris*, to be 7 Hours, 32 Minutes, equal to 110 Degrees, 41 Minutes, from an Emersion of *Mercury* from the Disk of the Sun, observed at *Canton* and *Nuremberg*, and an Eclipse of the Moon observed at *Nuremberg* and *Paris*, and although these Sort happen but rarely, yet when they do, they contribute their Assistance, in like manner, from an Observation of the Occultation of *Mars* by the Moon, the 21st of *August*, 1676, observed at *Dantzick* and *Greenwich*, the Difference of Meridians between *Greenwich* and *Dantzick*, was found to be 1 Hour, 14 Minutes, 49 Seconds in Time, answering to 18 Degrees, 41 Minutes, and 15 Seconds.

In the *Philosophical Transaction*, No. 1, for the Month of *March*, in the Year 1664-5, after the Invention of Pendulum Watches, by Monsieur *Hugens* of *Zulickem*, we have an Account of an Experiment made with two of them, by Major *Holmes*, in a Voyage from the Coast of *Guinea* homewards, at the Request of some of the eminent Virtuoso's, and grand Promoters of Navigation at that Time, in the Manner following.

The said Major having left the Coast, and being come to the Isle of St *Thomas*, under the Line, accompanied with four Vessels, having there adjusted his Watch, he put to Sea, and sailed Westward seven or eight hundred Leagues, without changing his Course; after which finding the Wind favourable, he steered towards the Coast of *Africk*, North North-East, but having sailed upon that Line, a matter of two or three hundred Leagues, the Masters of the other Ships under his Conduct, apprehending they should want Water before they could reach that Coast, did propose to him to steer their Coast to *Barbadoes*, to supply themselves with Water there, whereupon the said Major, having called the Masters and Pilots together, and caused them to produce their Journals and Calculations, it was found that those Pilots did differ in their Reckoning from that of the Major, one of them eighty Leagues, another about one hundred, and the third more, but the Major judging by his Pendulum Watches that they were only some thirty Leagues from the Isle of *Fuego*, which is one of the Isles of Cape *Vird*, and that they might reach it the next Day; and having a great Confidence in the said Watches, resolved to steer their Course thither, and having given Orders so to do, they got the very next Day, about Noon, a Sight of the said Isle

Isle of *Fuego*, finding themselves to sail directly upon it, and so arrive at it that Afternoon.

These and some other Successes encouraged Monsieur so far, that after he had improved the Structure of these Watches, he published an Account at large in the *Belgic Toungl*, which was afterwards translated into *English*, and published in the *Philosophical Transactions*, No. 47, for the Month of *May*, 1669, shewing how, and in what manner, these Watches are to be used, in finding the Longitude at Sea, with Directions for adjusting them, which Account the curious Reader may see at large, in the abovementioned *Transactions*, No. 47, in the reading of which, if he is ignorant of these Matters, he will meet with something worthy of his Notice.

In this short Narrative, you have a succinct Account of the most rational Methods for finding the Differences of Longitude of Places, together with the Success that attended them, and if Persons who have sufficient Skill, and furnished with proper Instruments, would lay hold of the many Opportunities that offer themselves to put them in Practice, our Sea Charts would soon be better rectified, and we should have a new and true Description of this our Terraqueous Globe.

In the Collection of Observations, you have the Difference between the Times observed, and the Times deduced from Calculation, as well as the principal Elements of the Calculations themselves, by which the sagacious Reader will be enabled to make farther Improvement in the Tables, and be better enabled to see from what Causes the Errors arise; this I have often thought of doing myself, but have been prevented by my daily Avocations, however, I hope at some convenient Time, to do it myself, when I shall endeavour to bring them much nearer to the Truth than they are at present.

A COL-

A COLLECTION of

ECLIPSES

OF THE

Four Satellites of *Jupiter*,

Made at the Times and Places therein mentioned; compared with the Times deduced from the Preceding TABLES.

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1677	June	6	14	6	11	I	10	17	15	8
			22	12	22	36	I	10	18	39	46
		September	8	11	36	20	E	10	25	36	6
			17	8	0	4	E	10	26	23	39
	1680	October	11	14	31	41	I	2	7	43	00
			13	8	59	57	I	2	7	52	27
			25	18	19	35	I	2	9	2	46
	1681	September	21	17	35	19	I	3	7	22	57
		October	16	12	13	36	I	3	9	27	8
		November	8	12	23	26	I	3	11	22	2
	1682	February	3	8	2	10	E	3	18	32	26
			19	6	22	26	E	3	19	50	51
		March	5	10	12	45	E	3	21	0	24
		April	20	10	41	46	E	3	24	45	30
		October	19	15	33	9	I	4	9	23	48
		November	25	19	14	30	I	4	12	20	22
		December	4	15	37	58	I	4	13	2	22
			13	11	59	38	I	4	13	38	46
	1683	March	8	13	26	10	E	4	20	25	20
		October	22	18	19	48	I	5	8	5	oc

Obferved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
15	16	43	4	49	—	0	2	45	8	1	8	29	2	46	—
13	34	44	6	23	—	0	4	9	46	1	8	28	2	43	—
10	36	23	7	5	—	0	11	6	6	1	8	22	1	20	+
6	59	47	6	25	—	0	11	53	39	1	8	20	1	38	4
15	40	57	6	6	—	3	23	13	00	1	4	41	1	31	—
10	9	38	6	13	—	3	23	22	27	1	4	42	1	14	—
19	30	40	6	56	—	3	24	32	46	1	4	46	0	37	—
18	44	41	0	15	+	4	22	52	57	1	6	52	2	45	+
13	25	8	2	23	—	4	24	57	8	1	7	1	2	8	+
13	36	57	4	39	—	4	26	52	2	1	7	8	1	44	+
7	58	1	5	2	—	5	4	2	26	1	7	39	1	32	—
5	15	18	3	35	—	5	5	20	51	1	7	44	2	59	—
9	3	58	2	4	—	5	6	30	24	1	8	47	3	4	—
9	27	3	3	3	+	5	10	15	30	1	7	58	3	42	—
16	29	5	1	30	+	5	25	23	48	1	8	27			
20	28	38	2	13	—	5	27	58	47	1	8	29	3	22	+
16	50	59	3	12	—	5	28	32	22	1	8	29	1	20	+
13	13	2	3	58	—	5	29	8	46	1	8	30	0	52	—
14	49	15	4	00	—	6	5	55	20	1	8	27			
19	21	48	5	9	+	6	23	35	00	1	7	49	0	40	+

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp.	S.	°	′	″
Greenwich	1683	November	30	16	41	51	I	5	11	3	58
— —	1684	January	8	15	5	11	I	5	14	2	26
			31	15	12	59	I	5	15	47	4
		February	2	9	41	57	I	5	15	55	46
		March	28	8	41	29	E	5	20	6	46
		May	4	12	48	25	E	5	22	56	3
	1686	June	13	9	19	44	E	7	21	30	49
	1687	January	18	18	24	40	I	8	8	43	20
		February	10	18	33	35	I	8	10	32	52
		July	25	10	47	43	E	8	23	47	42
	1688	August	5	10	18	58	E	9	25	14	58
		September	29	7	12	17	E	9	29	57	58
	1689	July	7	14	51	54	I	10	24	40	13
			16	11	13	55	I	10	25	27	35
		August	24	11	58	39	E	10	28	56	22
		November	3	7	8	37	E	11	5	9	20
	1690	January	4	6	0	40	E	11	10	54	23
		August	20	11	21	30	I	0	1	44	8
		October	7	8	26	10	E	0	6	7	26
		October	30	8	40	6	E	0	8	14	3

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
17	57	31	1	9	+	6	27	3	58	1	7	39	9	10	+
16	17	51	3	00	—	7	0	2	26	1	7	24	2	17	+
16	28	22	4	33	—	7	1	47	42	1	7	16	3	34	+
11	0	30	4	45	—	7	1	55	46	1	7	15	6	41	—
7	40	52	4	12	—	7	6	6	46	1	6	59	2	10	+
11	39	38	0	54	—	7	22	56	3	1	6	46	3	5	—
8	21	38	3	36	—	9	7	30	49	1	4	4	2	22	+
19	20	54	4	36	+	9	24	43	20	1	4	48	3	58	—
19	32	12	2	18	+	9	26	32	52	1	4	55	4	0	—
9	48	29	3	42	+	10	9	47	42	1	5	53	2	57	+
9	20	56	6	27	—	11	11	14	58	1	8	4	3	35	+
6	8	50	1	26	—	11	15	57	58	1	8	15	3	2	+
16	5	12	7	11	—	0	10	40	13	1	8	21	2	14	—
12	28	39	7	39	—	0	11	27	35	1	8	20	1	15	—
10	59	42	8	7	—	0	14	56	22	1	8	13	1	9	+
6	5	39	2	21	—	0	21	9	20	1	7	57	2	38	+
4	51	19	3	37	+	0	26	54	23	1	7	37	1	53	+
12	33	22	7	55	—	1	17	44	8	1	6	3	2	6	—
7	28	19	8	12	—	1	22	7	26	1	5	45	0	18	—
7	41	36	6	44	—	1	24	14	3	1	5	34	0	20	+

ECLIPSES of the First Satellite of JUPITER,

Place of Observation	Mean Time of the Eclipse at *London.*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1690	August	20	11	21	30	I	0	1	44	8
		October	7	8	26	18	E	0	6	7	26
			30	8	40	6	E	0	8	14	3
		November	22	8	54	31	E	0	10	20	38
			29	10	50	11	E	0	10	59	34
	1691	January	7	9	25	41	E	0	14	33	40
		February	8	6	4	34	E	0	17	28	47
		August	9	11	8	8	I	1	4	6	43
			23	14	57	2	I	1	5	23	57
			25	9	25	45	I	1	5	33	33
Seen thro' Clouds		November	27	6	58	7	E	1	14	3	24
	1692	August	4	12	43	52	I	2	6	26	11
	1693	January	16	5	12	56	E	2	20	45	26
	1694	February	9	14	9	59	E	3	23	21	43
			27	6	57	39	E	3	24	48	13
		April	21	9	20	50	E	3	29	6	18
	1695	January	11	18	13	54	I	4	20	11	9
		April	1	12	3	41	E	4	26	24	18
			10	8	27	18	E	4	27	5	29
			17	10	22	8	E	4	27	38	27

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
12	33	32	7	55	—	1	17	44	8	1	6	3	2	6	—
7	28	19	8	12	—	1	22	7	26	1	5	45	0	18	—
7	41	36	6	44	—	1	24	14	3	1	5	34	0	20	+
7	54	45	4	31	—	1	26	20	38	1	5	25	1	9	+
9	49	56	3	44	—	1	26	59	34	1	5	21	1	22	+
8	21	37	0	31	+	2	0	33	40	1	5	7	1	34	+
4	58	10	3	26	+	2	3	28	47	1	4	55	1	57	+
12	14	7	3	43	—	2	20	6	42	1	4	7	1	51	—
16	3	41	5	8	—	2	21	23	57	1	4	5	2	34	—
10	32	22	5	18	—	2	21	33	33	1	4	5	2	47	—
5	52	51	7	5	—	3	0	3	24	1	4	0	8	21	—
13	44	43	1	6	+	3	22	26	11	1	4	40	2	43	—
4	9	20	4	57	—	4	7	5	26	1	5	40	2	53	—
13	2	42	4	46	—	5	9	41	43	1	7	59	4	4	—
5	48	30	3	4	—	5	11	8	13	1	8	3	4	10	—
8	5	35	2	39	+	5	15	26	18	1	8	14	4	22	—
19	28	35	5	29	—	6	6	31	9	1	8	26	0	46	+
10	52	37	3	3	—	6	12	44	18	1	8	17	5	51	—
7	15	15	1	8	—	6	13	25	29	1	8	16	4	55	—
9	9	22	0	23	—	6	13	58	27	1	8	15	4	54	—

ECLIPSES of the First Satellite of *JUPITER*,

Place of	Mean Time of the Eclipse at *London*.							♃ Helioc. Place			
Observation	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1695	May	26	8	54	34	E	5	0	39	18
—		June	18	9	6	57	E	5	2	25	52
	1696	January	18	10	5	55	I	5	18	49	2
		February	10								
		April	12	11	10	8	I	5	25	16	29
	1697	February	19	14	59	48	I	6	18	58	14
		March	23	11	29	51	I	6	21	22	31
		April	17	8	22	37	E	6	23	15	30
		May	24	12	25	22	E	6	26	4	38
		June	9	10	43	43	E	6	27	17	23
	1698	January	30	17	49	13	I	7	15	16	12
		February	22	17	57	6	I	7	17	2	36
	1699	June	1	10	24	3	I	8	23	41	20
		1	17	10	56	00	E	8	24	59	32
		August	18	9	41	46	E	9	0	3	21
	1700	March	17	16	50	6	E	9	17	44	26
		June	10	15	29	19	I	9	24	58	40
		August	13	10	55	25	E	10	0	27	25
		September	5	11	9	48	E	10	2	27	19
		December	1	4	44	20	E	10	9	59	51

Observed at the Places and Times hereunder mentioned.

Mean			Equat.			Light from the N.				Semiduration			Difference		
H.	M.	S.	'	''		S.	°	'	''	H.	M.	S.	M.	S.	
7	36	56	3	22	+	6	26	59	18	1	8	8	6	8	−
7	47	44	5	49	+	6	18	55	52	1	8	3	5	21	−
11	18	24	5	14	−	7	5	19	2	1	7	2	0	13	−
10	7	11	3	27	−	7	11	46	29	1	6	32	0	2	−
16	12	21	3	28	−	8	5	28	14	1	4	48	4	17	+
12	45	20	5	11	−	8	7	52	31	1	4	39	5	47	+
7	24	34	4	59	−	8	9	45	30	1	4	32	1	28	+
11	23	14	2	34	−	8	12	34	38	1	4	24	0	18	−
9	39	36	1	2	−	8	13	47	13	1	4	19	0	50	−
18	52	51	1	14	+	9	1	46	12	1	3	2	0	15	−
19	3	3	1	22	−	9	3	32	36	1	5	57	0	33	+
11	42	29	6	36	−	10	10	11	20	1	5	55	5	55	+
9	59	42	6	28	−	10	11	29	32	1	6	9	3	14	+
8	39	58	1	59	−	10	16	43	21	1	6	25	2	38	+
15	47	54	1	26	+	11	4	24	26	1	7	42	6	56	+
16	46	14	6	40	−	11	11	38	40	1	8	4	1	11	+
9	56	59	6	26	−	11	17	7	25	1	8	17	3	25	+
10	7	21	4	37	−	11	19	7	19	1	8	28	1	15	+
3	32	58	3	59	+	11	26	29	21	1	8	28	1	5	+

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1701	May	7	14	58	13	I	10	23	54	29
		June	15	13	24	31	I	10	27	23	8
Upminster		October	12	5	36	30	E	11	8	3	44
			19	7	30	47	E	11	8	42	10
	1702	October	15	9	4	7	E	0	11	39	40
			24	5	26	47	E	0	12	28	21
	1703	August	24	13	40	17	I	1	10	14	4
	1704	August	28	11	34	13	I	2	13	7	21
		September	4	13	27	7	I	2	13	44	21
		December	23	9	12	40	E	2	21	34	20
Greenwich	1705	March	2	9	55	6	E	2	29	6	46
Upminster.			25	10	7	57	E	3	1	3	45
		September	7	16	38	8	I	3	14	58	16
		December	15	19	13	[illegible]	I	3	23	6	38
Greenwich	1706	March	7	7	31	8	E	3	29	43	26
Upminster			30	7	44	42	E	4	1	34	38
	1707	February	24	6	37	47	E	4	27	41	42
		May	11	9	12	51	E	5	3	34	39
	1709	June	10	9	20	18	E	7	1	22	49
	1711	August	19	8	21	59	E	9	4	28	35

Observed at the Places and Times hereunder mentioned.

Mean ☉			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
16	4	21	1	2	−	0	10	34	29	1	8	22	3	16	−
14	36	21	5	5	−	0	14	3	8	1	8	15	1	34	−
4	36	59	5	18	−	0	25	3	44	1	7	44	2	55	+
6	31	45	4	35	−	0	25	42	10	1	7	42	3	5	+
8	7	7	8	23	−	1	28	39	40	1	5	15	0	8	−
4	30	40	7	35	−	1	29	28	21	1	5	11	1	29	+
14	47	10	4	40	−	2	27	14	4	1	4	2	1	49	−
12	39	34	0	23	−	4	0	17	21	1	5	9	0	11	−
14	34	14	1	21	−	4	0	54	21	1	5	9	0	37	+
8	46	13	0	26	−	4	16	6	46	1	6	22	2	57	−
8	58	21	1	59	+	4	18	18	45	1	6	33	1	4	−
17	47	12	2	54	+	5	02	13	16	1	7	33	4	25	+
20	28	3	6	10	−	5	10	26	38	1	8	0	0	52	+
6	22	29	2	34	−	5	16	43	26	1	8	17	2	56	−
6	33	55	0	3	−	5	18	59	38	1	8	21	2	29	−
5	32	7	5	10	−	6	15	11	42	1	8	13	3	37	−
7	58	40	1	49	+	6	21	4	39	1	7	57	4	25	−
8	17	46	1	19	−	8	19	2	49	1	4	8	0	17	−
7	20	29	2	32	−	10	22	18	25	1	6	51	2	40	+

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*. Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	′	″
Upminster	1713	October	27	8	8	17	E	11	14	10	00
Rome		September									
		November									
		November									
		December									
Upminster		December	28	7	2	0	E	11	19	49	6
	1717	February	1	6	23	1	E	3	1	5	57
			8	8	19	48	E	3	1	41	55
Lisbon	1723	July	12	7	16	22	E	9	5	51	8
		August	27	8	56	3	E	9	9	30	32
	1724	May	27	14	38	21	I	10	2	48	36
		June	3	16	32	43	I	10	3	35	24
			18								
		August									
			29	12	7	48	E	10	10	59	14
		September	14	10	27	7	E	10	12	23	4
			23	6	51	42	E	10	13	9	41
		October	7	10	42	56	E	10	14	24	45
			23	9	2	48	E	10	15	48	38

[illegible]

[illegible]			[illegible]							[illegible]			[illegible]		
H.	M.	S.				S.				H.	M.	S.	M.	S.	
7	9	55	4	24	—	1	2	10	00	1	7	14	4	20	+
5	54	27	2	6	+	1	7	49	6	1	6	51	1	24	+
5	20	50	4	3	—	4	19	35	57	1	6	44	1	30	+
7	15	19	3	18	—	4	20	11	55	1	6	42	1	5	—
7	26	52	6	3	—	10	24	20	54	1	7	3	4	20	+
7	41	4	3	45	+	10	28	10	32		7	16	4	2	—
15	51	34	5	18	—	11	21	28	36	1	8	24	0	19	—
17	47	18	5	49	—	11	22	15	24	1	8	25	0	21	—
11	9	54	6	10	—	11	29	39	14	1	8	27	4	23	+
9	27	48	4	54	—	0	1	23	4	1	8	29	4	16	+
5	51	4	4	2	—	0	2	9	41	1	8	29	3	55	+
9	40	23	2	31	—	0	3	24	45	1	8	28	3	24	+
7	58	17	0	51	+	0	4	48	38	1	8	27	4	47	+

ECLIPSES of the First Satellite of JUPITER.

Place of Observation	Mean Time of the Eclipse at London								Heliocen. Place		
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Rome	1724	May									
		June									
		June									
		August									
		September									
Albani		October									
Southwick N		November	8	7	25	2	E	10	17	13	56
Pekin			18	22	16	54	E	10	18	9	22
		December	11	22	32	30	E	10	20	11	42
	1725	June	26	7	13	37	I	11	7	47	27
		July	28	8	45	37	I	11	10	49	13
Southwick		August	18	9	28	18	I	11	12	49	49
Pekin		September	6	22	58	44	E	11	14	22	20
			28	4	42	51	E	11	16	17	43
			29	23	16	30	E	11	16	27	23
		October	7		17	42	E	11	17	6	26
			14								
			22	23	25	7	E	11	18	28	28
			7	21	41	56	E	11	20	0	6
Lisbon		July	17	12	54	50	I	11	9	42	10

I i

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semidurat.			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
6	16	20	0	27	+	0	6	13	56	1	8	27	1	12	+
21	8	12	1	30	+	0	7	9	22	1	8	26	1	34	+
21	20	51	2	41	—	0	9	11	42	1	8	24	5	56	—
8	24	32	5	20	—	0	26	47	27	1	7	37	2	2	—
4	58	33	7	42	—	0	29	40	13	1	7	24	2	10	—
10	45	49	8	30	—	1	1	40	49	1	7	16	1	45	+
22	0	54	8	24	—	1	3	22	20	1	7	11	0	57	+
3	45	11	4	34	—	1	5	17	43	1	7	3	4	49	+
22	6	53	7	45	—	1	5	27	23	1	7	1	3	21	—
0	8	42	6	45	—	1	6	6	20	1	6	59	1	14	+
22	26	23	8	33	—	1	7	28	28	1	6	53	0	24	—
20	45	11	8	34	—	1	9	0	6	1	6	46	1	27	+
14	8	44	6	58	—	0	28	42	10	1	7	30	0	34	—

ECLIPSES of the First Satellite of JUPITER,

Place of Observation	Mean Time of the Eclipse at *London*. Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	′	″
Lisbon	1725	September	1	15	32	26	E	11	13	52	57
			3	9	59	47	E	11	14	4	30
			10	11	54	7	E	11	14	41	13
Toulon			12	6	25	9	E	11	14	50	50
		October	5	6	37	11	E	11	16	56	21
Lisbon			12	8	32	3	E	11	17	35	00
			28	6	50	37	E	11	19	2	4
		November	4	8	46	22	E	11	19	40	44
			27	9	1	48	E	11	21	46	14
Toulon		December	6	5	29	48	E	11	22	35	3
Lisbon			29	5	43	14	E	11	24	41	10
Upminster	1726	January	5	7	38	21	E	11	25	20	1
Lisbon			0	7	38	13	E	The same Eclipse			
		May	12	15	57	25	E	0	6	59	25
		June	20	14	27	31	I	0	10	33	32
			27	16	22	38	I	0	11	12	29
		July	6	12	43	54	I	0	12	1	10
			29	12	54	57	I	0	14	7	36
		August	5	14	47	34	I	0	14	46	35
			12	16	42	59	I	0	15	25	31

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			☽ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
14	34	47	8	31	−	1	2	52	57	1	7	11	1	1	+
9	3	34	8	30	−	1	3	4	30	1	7	11	2	28	+
10	58	17	8	19	−	1	3	41	13	1	7	8	2	59	+
5	26	48	8	14	−	1	3	50	50	1	7	8	0	33	+
5	39	50	6	57	−	1	5	56	21	1	6	59	2	41	+
7	34	58	6	23	−	1	6	35	00	1	6	57	3	29	+
5	53	1	4	53	−	1	8	2	4	1	6	50	4	21	+
7	47	48	4	8	−	1	8	40	44	1	6	47	4	5	+
8	0	50	1	37	−	1	10	46	14	1	6	37	4	2	+
4	24	23	0	39	−	1	11	35	3	1	6	33	0	29	+
4	37	28	1	40	+	1	13	41	10	1	6	22	2	16	+
6	32	44	0	53	−	1	14	20	1	1	6	19	3	10	+
Observed at both Places.													3	35	+
16	54	31	2	34	+	1	25	59	25	1	5	26	5	46	−
15	30	42	0	57	−	2	0	33	32	1	5	9	2	53	−
17	25	32	1	41	−	2	1	12	29	1	5	5	3	52	−
13	48	49	2	37	−	2	2	1	10	1	5	1	2	43	−
14	2	12	4	59	−	2	3	7	36	1	4	57	2	41	+
15	57	1	5	38	−	2	3	46	35	1	4	54	1	5	−
17	51	49	6	15	−	2	4	25	31	1	4	51	2	16	−

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	'	''
Petersbourg	1726	June	29	10	50	14	I	0	11	22	12
	1726	July	29	12	54	57	I	0	14	7	39
		August	7	9	17	41	I	0	14	56	19
Lisbon			14	11	11	5	I	0	15	35	14
			21	13	5	35	I	0	16	13	48
			30	9	27	43	I	0	17	2	44
		September	4	16	52	51	I	0	17	31	58
			6	11	22	20	I	0	17	41	40
			13	13	16	0	I	0	18	20	33
Upminster			15	7	44	14	I	0	18	30	16
Lisbon			29	11	31	59	I	0	19	48	2
Petersbourg		October	8	10	5	18	E	0	20	37	8
Lisbon			15	12	0	17	E	0	21	15	45
Lisb.&Peterf.			17	6	29	34	E	0	21	25	45
Lisbon			24	8	26	23	E	0	22	4	35
			31	10	18	31	E	0	22	43	29
		November	9	12	42	41	E	0	23	31	35
			25	5	1	24	E	0	21	25	54
		December	18	5	16	50	E	0	27	5	35
Upminster			25	7	10	58	E	0	27	44	16

Observed at the Places and Times hereunder mentioned.

Mean ☉			Equat. Light			✱ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
11	54	14	11	53	—	2	0	22	12	1	5	7	3	0	—
14	2	12	5	3	—	2	3	7	39	1	4	57	2	45	—
10	25	43	5	47	—	2	3	56	19	1	4	53	2	38	—
12	20	32	6	25	—	2	4	35	14	1	4	51	1	49	—
14	15	18	6	57	—	2	5	13	48	1	4	46	1	14	—
10	38	52	7	36	—	2	6	2	44	1	4	46	1	13	—
18	4	59	7	54	—	2	6	31	58	1	4	44	0	30	—
12	33	27	7	57	—	2	6	40	20	1	4	43	1	33	—
14	28	28	8	19	—	2	7	20	33	1	4	41	0	31	—
8	57	20	8	23	—	2	7	30	16	1	4	42	0	0	
12	45	45	8	43	—	2	8	48	2	1	4	36	0	27	+
9	10	23	8	40	—	2	9	37	8	1	4	35	0	30	+
11	5	9	8	31	—	2	10	15	45	1	4	31	0	52	+
5	33	58	8	27	—	2	10	25	45	1	4	31	0	43	+
7	28	42	8	8	—	2	11	4	35	1	4	29	1	30	—
9	23	22	7	44	—	2	11	43	29	1	4	27	1	44	+
5	46	58	7	11	—	2	12	31	31	1	4	26	1	34	+
4	18	26	3	19	—	2	16	5	35	1	4	15	2	32	+
6	13	36	2	31	—	2	16	44	16	1	4	14	4	33	+

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Petersbourg	1727	July	27	9	3	10	I	1	17	9	0
		August	10	12	51	41	I	1	18	25	26
			19	9	18	6	I	1	19	1	32
			26	11	7	57	I	1	19	51	14
		September	4	7	29	59	I	1	20	38	52
		October	20	7	51	8	I	1	24	45	49
Pekin			22	2	18	38	I	1	24	55	18
			29	4	12	12	I	1	25	33	32
			30	22	42	6	I	1	25	42	39
Pekin Peterſ.		November	21	6	34	13	E	1	27	36	37
Pekin			28	8	28	37	E	1	28	14	23
			30	2	57	21	E	1	28	23	50
		December	1	21	26	1	E	1	28	33	13
			7	4	51	34	E	1	29	1	29
			8	23	20	1	E	1	29	10	50
			14	6	46	52	E	1	29	39	19
			16	1	15	14	E	1	29	48	43
			23	3	10	30	E	2	0	26	17
			24	21	39	27	E	2	0	34	26
Petersbourg			28	10	39	24	E	2	0	54	31

Obſerved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
16	5	18	0	37	—	3	6	9	0	1	4	3	2	32	—
13	54	46	1	18	—	3	7	25	26	1	4	4	2	19	—
12	12	53	3	36	—	3	8	51	14	1	4	6	2	46	—
8	36	17	4	29	—	3	9	38	52	1	4	6	2	17	—
9	1	52	7	53	—	3	13	45	49	1	4	14	1	23	—
3	30	32	7	57	—	3	14	5	18	1	4	15	0	42	—
5	25	34	8	8	—	3	14	43	32	1	4	17	0	57	+
23	53	54	8	10	—	3	14	52	39	1	4	17	0	39	—
5	38	1	7	59	—	3	16	46	37	1	4	23	0	30	+
7	32	42	7	39	—	3	17	24	23	1	4	25	0	51	+
2	1	22	7	33	—	3	17	33	50	1	4	25	0	58	+
20	30	1	7	28	—	3	17	43	13	1	4	25	0	57	+
3	56	24	7	9	—	3	18	11	29	1	4	27	2	12	+
22	25	6	7	3	—	3	18	20	56	1	4	27	2	29	+
5	48	36	6	38	—	3	18	49	19	1	4	28	0	26	—
0	19	23	6	29	—	3	18	58	43	1	4	29	2	9	+
2	14	12	5	52	—	3	19	36	17	1	4	51	2	20	+
20	42	55	5	45	—	3	19	44	26	1	4	51	2	15	+
9	40	2	5	24	—	3	19	54	31	1	4	32	0	12	—

ECLIPSES of the First Satellite of *JUPITER*.

Place of Obſervation	Mean Time of the Eclipſe at *London* Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	′	″
Pekin Peterſ.	1727	December	30	5	6	54	E	2	1	3	58
Pekin			31	23	35	47	E	2	1	13	23
Peterſbourg	1728	January	6	7	2	15	E	2	1	45	25
Pekin			8	1	29	35	E	2	1	56	30
			15	3	25	50	E	2	2	35	52
			16	21	54	27	E	2	2	43	12
			23	23	50	11	E	2	3	20	56
			31	1	45	9	E	2	3	58	18
Peterſbourg		February	5	9	11	46	E	2	4	21	04
Pekin			7	3	40	41	E	2	4	35	47
			8	22	9	52	E	2	4	45	7
Peterſbourg			28								
Pekin		March	10	9	20	0	E	2	7	18	44
		September	8	5	19	18	I	2	23	7	59
			22	9	8	15	I	2	24	20	39
		October	1	5	30	3	I	2	25	6	19
			8	7	24	53	I	2	25	42	31
			15	9	17	15	I	2	26	18	46
			24	5	40	15	I	2	27	3	20
			31	7	34	19	I	2	27	40	17

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
4	7	54	5	15	—	3	20	3	18	1	4	32	0	16	+
22	37	45	5	3	—	3	20	23	23	1	4	32	1	27	+
6	3	48	4	33	—	3	20	41	25	1	4	32	1	32	+
0	33	9	4	12	—	3	21	6	30	1	4	35	3	57	+
0	28	6	3	27	—	3	21	43	52	1	4	35	4	56	+
20	56	59	3	15	—	3	21	53	12	1	4	39	2	26	+
22	51	9	2	27	—	3	22	30	56	1	4	40	3	11	+
0	45	44	1	30	—	3	23	8	18	1	4	42	3	47	+
8	11	5	1	12	—	3	23	21	4	1	4	43	3	0	+
2	40	25	0	50	—	3	23	45	47	1	4	45	3	41	+
21	9	5	0	45	—	3	23	55	7	1	4	46	3	14	+
23	14	24	0	52	—	3	26	28	44	1	4	55	1	33	—
6	26	6	0	24	—	4	12	17	59	1	6	4	0	20	+
10	12	48	1	56	—	4	13	30	39	1	6	9	3	22	—
6	35	58	2	50	—	4	14	16	19	1	6	12	3	07	—
8	30	29	3	32	—	4	14	52	31	1	6	16	4	12	—
10	24	59	4	15	—	4	15	28	46	1	6	19	2	50	—
6	48	1	4	52	—	4	16	13	20	1	6	22	3	28	—
8	42	36	5	38	—	4	16	50	17	1	6	25	3	46	

ECLIPSES of the First Satellite of *JUPITER*,

Place of Obſervation	Mean Time of the Eclipſe at *London.* Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	′	″
Pekin	1728	November	2	2	2	30	I	2	27	49	21
			7	9	27	43	I	2	28	16	28
			9	3	55	44	I	2	28	25	31
			16	5	49	39	I	2	29	1	34
			18	0	14	9	I	2	29	10	36
			25	2	13	19	I	2	29	46	42
			30	9	38	24	I	3	0	13	41
		December	3	22	36	32	I	3	0	31	47
			11	0	30	4	I	3	1	7	40
			19	23	7	44	E	3	1	53	9
			27	1	1	22	E	3	2	29	1
	1729	January	4	21	24	7	E	3	3	10	43
			10	4	49	54	E	3	3	40	46
			11	23	18	34	E	3	3	49	45
			19	1	13	53	E	3	4	25	45
		February	3	23	33	24	E	3	5	45	54
			26	23	45	47	E	3	7	41	45
		March	6	1	41	59	E	3	8	17	23
			13	3	36	20	E	3	8	51	50
		October	20	6	56	14	I	3	27	5	12

Observed at the Places and Times hereunder mentioned.

Mean ☍			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
3	11	14	5	46	—	4	16	59	21	1	6	26	3	28	—
10	37	7	6	10	—	4	17	26	26	1	6	28	3	14	—
5	5	44	6	17	—	4	17	35	31	1	6	29	2	46	—
7	2	30	6	39	—	4	18	11	34	1	6	32	0	20	—
1	31	10	6	44	—	4	18	20	36	1	6	33	3	44	—
3	25	39	7	5	—	4	19	16	42	1	6	37	1	22	—
10	49	11	7	13	—	4	19	23	41	1	6	38	3	4	—
23	46	25	7	17	—	4	19	41	43	1	6	40	4	4	—
1	40	55	7	23	—	4	20	17	40	1	6	42	3	14	—
22	4	4	7	13	—	4	21	3	9	1	6	46	4	7	—
23	58	31	6	37	—	4	21	39	1	1	6	48	2	40	—
20	23	36	6	35	—	4	22	25	43	1	6	52	0	14	—
3	49	48	6	15	—	4	22	55	46	1	6	55	0	34	+
22	18	26	6	8	—	4	23	4	45	1	6	55	1	21	—
0	12	55	5	34	—	4	23	40	45	1	6	58	0	26	—
22	30	23	4	8	—	4	25	0	52	1	7	3	0	6	—
22	42	18	1	37	—	4	26	56	45	1	7	11	1	55	+
0	36	43	0	35	—	4	27	32	23	1	7	14	1	22	+
2	31	4	0	4	—	4	28	6	50	1	7	15	1	55	+
8	4	42	0	13	—	5	16	25	12	1	8	14	0	01	—

ECLIPSES of the First Satellite of *JUPITER*,

Place of Obſervation	Mean Time of the Eclipſe at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Pekin	1729	November	3	10	43	27	I	3	28	14	6
			5	5	12	7	I	3	28	22	38
			19	8	58	54	I	3	29	31	21
			26	10	51	41	I	4	0	5	36
		December	5	7	14	10	I	4	0	48	28
			7	1	43	9	I	4	0	56	57
			14	3	36	47	I	4	1	31	11
			19	11	1	15	I	4	1	56	59
			21	5	30	26	I	4	2	5	10
			28	7	24	56	I	4	2	44	24
			30	1	52	54	I	4	2	48	13
	1730	January	6	3	46	58	I	4	3	22	17
			13	7	59	58	E	4	3	56	56
			22	4	22	16	E	4	4	39	23
			29	6	17	48	E	4	5	13	23
		February	5	8	12	36	E	4	5	47	22
			7	2	39	47	E	4	5	55	50
			14	4	34	57	E	4	6	29	29
			15	23	3	35	E	4	6	38	19
			23	0	57	53	E	4	7	12	23

Obſerved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
11	53	19	1	51	—	5	17	34	6	1	8	16	0	15	—
6	21	53	1	26	—	5	17	42	38	1	8	16	0	4	+
10	10	26	3	23	—	5	18	51	21	1	8	19	0	10	+
12	4	42	4	0	—	5	19	25	30	1	8	20	0	41	+
8	27	34	4	45	—	5	20	8	28	1	8	22	0	17	—
2	56	7	4	52	—	5	20	16	57	1	8	22	0	16	—
4	50	24	5	22	—	5	20	58	2	1	8	22	0	9	—
12	15	41	5	26	—	5	21	16	50	1	8	24	0	14	—
6	44	15	5	44	—	5	21	25	10	1	8	24	0	19	—
8	39	5	6	3	—	5	22	4	24	1	8	24	0	18	—
3	7	26	6	9	—	5	22	8	13	1	8	25	0	2	—
5	1	47	6	18	—	5	22	42	27	1	8	26	0	5	—
6	56	5	6	21	—	5	23	16	56	1	8	26	1	48	—
3	18	54	6	13	—	5	24	9	23	1	8	27	1	8	—
5	13	31	6	10	—	5	24	43	23	1	8	27	1	40	—
7	7	23	5	35	—	5	25	17	22	1	8	27	2	3	+
1	35	57	5	30	—	5	25	25	50	1	8	28	1	12	—
3	30	53	5	5	—	5	25	50	29	1	8	28	0	41	—
21	56	24	4	57	—	5	26	8	19	1	8	29	2	39	—
23	52	58	4	24	—	5	26	42	23	1	8	28	0	51	—

ECLIPSES of the First Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
	1730	March	2	2	52	45	E	4	7	48	31
			9	4	43	50	E	4	8	22	21
			18	1	12	6	E	4	9	2	14
			25	3	6	24	E	4	9	36	5
		May	3	1	38	20	E	4	12	41	19
		June	11	0	10	28	E	4	15	45	53
		October	23	9	57	28	I	4	26	17	1
				Omitted							
Bologna	1726	December	25	6	10	36	E				
			27	8	13	49	E				
	1727	August	10	12	50	5	I	1	18	25	26
			26	11	6	2	I	1	19	51	16
Lisbon		October	4	9	32	54	I	1	23	40	47
			27	9	46	12	I	1	25	28	2

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			☾ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
1	47	28	3	45	—	5	27	18	31	1	8	28	0	34	—
3	41	42	3	4	—	5	27	52	21	1	8	29	0	6	+
0	6	4	2	11	—	5	28	32	14	1	8	29	0	15	+
1	58	24	1	25	—	5	29	6	5	1	8	29	0	56	—
0	26	33	2	47	+	6	2	11	19	1	8	29	0	31	—
22	54	38	6	5	+	6	5	15	53	1	8	27	1	18	—
11	3	24	6	33	—	6	15	47	1	1	8	13	2	50	—
13	54	46	1	20	—	3	7	25	26	1	4	4	0	43	—
12	12	54	3	35	—	3	8	51	16	1	4	6	0	49	—
10	43	48	6	53	—	3	12	20	47	1	4	10	0	9	—
10	57	5	8	6	—	3	14	28	2	1	4	16	1	29	—

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	'	''
Greenwich	1681	December	11	8	32	41	I	3	14	5	35
	1682	September	21	16	41	5	I	4	7	10	18
	1683	November	18	14	38	9	I	5	10	8	30
		December	20	14	13	27	I	5	12	35	16
			27	16	47	20	I	5	13	7	48
	1684	January	3	19	12	49	I	5	13	40	22
	1685	February	15	12	5	37	I	6	14	38	51
		March	12	9	8	9	I	6	16	31	41
		April	13	11	9	23	E	6	18	57	18
		May	8	8	10	31	E	6	20	50	50
	1686	June	10	8	58	20	E	7	21	16	59
	1687	June	18	12	59	48	E	8	20	48	13
	1688	October	3	6	0	51	E	10	0	18	26
		November	4	5	46	35	E	10	3	4	29
	1689	September	2	7	59	45	E	10	29	44	45
	1691	January	2	6	55	49	E	0	14	5	36
		February	3	6	48	10	E	0	17	1	27
		September	29	7	10	42	I	1	8	43	31
		December	9	11	45	31	E	1	15	9	27
	1692	March	8	8	53	57	E	1	23	7	29

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			☋ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
10	10	6	6	47	—	4	29	5	25	1	24	16	6	22	+
17	53	43	4	21	+	5	22	10	18	1	26	49	9	50	—
15	51	57	2	27	+	6	25	8	30	1	25	10	8	55	—
15	30	24	1	18	—	6	27	35	16	1	24	48	9	1	—
18	5	23	1	54	—	6	28	07	48	1	24	43	8	44	—
20	33	3	2	43	—	6	28	40	22	1	24	38	7	7	—
13	15	19	3	35	—	7	29	38	51	1	18	57	13	23	—
10	17	54	4	59	—	8	1	31	41	1	18	38	13	52	—
9	55	39	4	56	—	8	3	57	18	1	18	14	0	26	—
6	58	25	3	32	—	8	6	50	50	1	17	49	2	11	+
7	44	48	3	53	—	9	7	16	50	1	16	12	1	13	—
11	42	24	6	6	—	10	7	18	13	1	20	13	3	18	—
4	25	13	1	8	—	11	17	18	26	1	26	32	9	14	—
4	7	49	3	16	+	11	20	4	29	1	26	43	8	47	—
6	50	58	7	2	—	0	15	44	45	1	26	16	10	27	+
5	37	23	0	1	—	2	0	5	36	1	18	53	0	27	—
5	22	18	3	0	+	2	3	1	27	1	18	23	4	29	—
8	48	16	7	52	—	2	24	43	31	1	16	6	13	36	+
10	53	34	6	5	—	3	1	9	27	1	16	0	17	58	+
7	29	10	3	8	+	3	9	7	29	1	16	19	5	20	—

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.						Sp	♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.		S.	°	'	''
Greenwich	1693	March	8	10	49	52	E	2	25	8	59
—		September	30	11	38	56	I	3	12	29	57
—	1694	March	2	9	55	38	E	3	25	3	28
—	1696	January	13	15	56	49	I	5	18	27	20
—	1697	March	4	11	10	26	I	6	19	55	42
—		May	7	12	52	55	E	6	24	47	21
—	1698	May	8	14	15	51	E	7	22	51	49
—	1699	May	9	12	42	21	I	8	21	49	51
—	1700	August	31	10	59	2	E	10	2	0	48
—	1701	July	31	10	11	41	I	11	1	30	5
—		August	7	13	47	11	I	11	2	8	34
—		October	28	10	0	32	E	11	9	31	38
—		November	22	7	15	3	E	11	11	46	56
Upminster	1702	September	9	14	52	57	I	0	8	23	3
—		October	15	6	47	28	E	0	11	39	11
—	1701	October	21	7	21	33	E	11	8	53	0
—	1702	October	22	9	22	25	E	0	12	18	16
Greenwich		November	16	6	45	2	E	0	14	35	6
Upminster	1703	December	19	8	39	19	E	1	20	45	6
—	1704	August	20	12	13	20	I	2	12	25	32

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
9	34	52	0	37	+	4	11	38	59	1	21	3	6	40	+
12	55	46	0	3	—	4	28	59	57	1	24	15	7	28	—
8	50	15	2	41	—	5	11	33	28	1	25	58	17	54	+
17	11	32	4	3	—	7	4	57	20	1	23	34	12	54	—
12	21	7	4	26	—	8	6	25	42	1	17	52	11	37	—
11	36	42	3	57	—	8	11	17	21	1	17	11	2	59	—
12	46	19	5	41	—	9	9	21	49	1	16	19	18	54	—
14	8	35	5	51	—	10	8	19	51	1	20	25	0	2	—
9	28	30	5	0	—	11	18	30	48	1	26	38	8	54	—
11	54	53	8	9	—	0	18	0	5	1	26	2	9	1	+
8	31	25	3	38	—	0	26	1	38	1	25	2	7	43	—
5	39	14	0	48	—	0	28	16	56	1	24	42	11	55	—
16	40	31	8	35	—	1	24	53	3	1	19	48	20	9	+
5	43	31	8	5	—	1	28	9	11	1	19	12	7	20	+
5	54	55	4	24	—	0	25	23	0	1	25	8	5	54	—
8	20	20	7	41	—	1	28	48	16	1	19	3	9	17	+
5	28	36	5	43	—	2	1	5	6	1	18	42	3	27	—
7	36	25	5	34	—	3	7	25	6	1	16	12	7	44	+
13	29	24	0	17	+	3	29	15	32	1	18	46	2	25	—

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Obſervation	Mean Time of the Eclipſe at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	'	''
Upminſter	1704	October	5	16	54	39	I	2	15	26	22
			16	8	44	17	I	2	17	21	57
	1705	January	20	10	28	19	E	2	25	37	20
		September	29	16	24	15	I	3	16	47	19
		October	31	15	54	15	I	3	19	25	5
		December	20	9	48	10	I	3	23	30	7
	1707	April	21	10	7	33	E	5	2	2	20
	1712	October	12	7	32	52	E	10	10	13	18
Greenwich	1713	November	7	6	51	18	E	11	15	10	31
Upminſter	1714	December	3	6	7	44	E	0	20	56	10
Pekin	1724	November	8	22	43	45	E	10	17	16	25
Southwick	1725	Auguſt	9	11	53	31	I	11	11	46	56
Upminſter	1725	October	30	8	58	46	E	11	19	13	25
Southwick	1725	December	26	5	59	49	E	11	24	24	44
Pekin	1725	October	9	1	4	31	E	11	17	17	54
			16	3	43	11	E	11	18	55	38
Upminſter	1726	Auguſt	28	8	51	43	I	0	16	51	39
Peterſbourg		September	11	14	4	26	I	0	18	9	45
		November	25	8	20	39	E	0	25	00	2
	1727	January	21	5	30	1	E	1	0	11	6

Obſerved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
18	10	17	4	35	—	4	2	16	22	1	19	17	8	14	—
10	16	32	6	17	—	4	4	11	57	1	19	38	5	10	+
9	25	50	4	54	—	4	12	37	20	1	21	14	13	51	+
17	39	0	0	33	+	5	3	47	12	1	25	0	9	42	—
17	19	37	2	44	—	5	6	25	5	1	25	22	2	44	—
11	22	27	6	22	—	5	10	30	7	1	25	52	2	3	+
8	53	18	3	10	+	11	19	32	20	1	26	42	15	37	+
5	51	52	1	28	—	11	27	43	18	1	26	59	15	19	—
5	15	5	3	12	—	1	2	40	31	1	23	58	15	17	—
4	49	36	4	27	—	2	8	56	10	1	17	31	5	4	—
21	1	30	2	46	—	0	6	16	25	1	26	54	18	7	—
13	26	43	7	15	—	1	0	46	56	1	24	25	1	32	+
7	27	21	4	39	—	1	8	13	25	1	22	57	13	7	—
4	20	22	1	23	+	1	13	24	44	1	21	0	17	4	—
23	37	50	6	40	—	1	6	17	54	1	23	19	10	2	—
2	28	29	6	8	—	1	7	55	38	1	23	00	2	10	+
10	24	12	7	28	—	2	5	51	39	1	17	57	7	4	+
15	37	35	8	13	—	2	7	9	45	1	17	47	7	9	+
7	4	23	5	46	—	2	14	0	0	1	16	53	5	9	—
4	24	34	0	2	+	2	19	11	4	1	16	8	12	28	+

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Petersbourg	1727	July	28	11	40	42	I	1	16	55	4
		August	22	8	41	51	I	1	19	29	14
			29	11	16	46	I	1	20	7	24
Bologna		January	28	8	5	29	E	1	0	50	28
Pekin		October	25	8	3	12	I	1	25	12	38
		November	19	7	43	21	E	1	27	25	39
			22	21	6	10	E	1	27	45	9
			29	23	45	0	E	1	28	24	8
		December	7	2	21	57	E	1	29	0	58
			14	5	1	56	E	1	29	38	50
Petersbourg			24	21	1	25	E	2	0	35	29
Pekin			28	10	20	34	E	2	0	54	16
			31	23	38	42	E	2	1	3	25
	1728	January	8	2	16	9	E	2	1	50	58
		February	1	23	32	13	E	2	4	3	5
			9	2	14	0	E	2	4	40	44
Petersbourg			16	4	51	52	E	2	5	17	39
Pekin		October	18	7	32	1	I	2	26	33	46
			25	10	6	17	I	2	27	10	7
		November	10	7	6	22	I	2	29	17	10

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
12	58	46	0	38	—	3	5	55	4	1	16	8	1	18	+
10	11	9	3	9	—	3	8	29	14	1	16	18	9	51	+
12	46	55	3	48	—	3	9	7	24	1	16	18	10	3	+
6	31	44	5	37	—	2	19	50	28	1	16	23	22	59	—
9	38	52	8	14	—	3	14	12	38	1	16	42	10	44	—
6	46	17	8	5	—	3	16	25	39	1	16	56	11	37	+
20	4	35	7	54	—	3	16	45	9	1	16	58	7	29	+
22	41	12	7	35	—	3	17	24	8	1	17	2	5	39	+
1	17	29	7	10	—	3	18	10	58	1	17	8	5	30	+
3	53	42	6	40	—	3	18	48	50	1	17	12	1	18	+
19	48	11	8	0	—	3	19	45	29	1	17	20	3	54	—
9	6	29	5	24	—	3	19	54	16	1	17	23	2	6	—
22	22	12	5	3	—	3	20	13	25	1	17	24	4	3	—
1	0	44	4	38	—	3	21	0	58	1	17	30	2	33	—
22	8	0	1	33	—	3	23	13	5	1	17	49	7	57	—
0	44	19	0	45	—	3	23	50	44	1	17	55	12	31	—
3	20	28	0	1	—	3	24	17	39	1	17	56	13	27	—
9	7	42	6	22	—	4	15	43	46	1	21	49	7	30	+
11	43	41	5	11	—	4	16	20	7	1	21	56	10	27	+
8	49	36	6	51		4	18	27	10	1	22	21	14	8	+

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	'	''
Pekin	1728	November	26	9	42	20	I	2	29	53	20
		December	7	1	36	19	I	3	0	47	36
			21	9	39	39	E	3	2	0	25
			24	22	56	46	E	3	2	18	28
	1729	January	8	4	9	25	E	3	3	30	34
			15	6	46	58	E	3	4	6	26
			25	22	42	40	E	3	5	0	22
		February	2	1	17	27	E	3	5	36	12
			9	3	56	37	E	3	6	12	1
			26	22	33	18	E	3	7	41	29
		March	6	1	11	55	E	3	8	17	12
			13	3	50	33	E	3	8	52	54
		May	9	0	59	13	E	3	13	37	3
		November	6	3	51	28	I	3	28	57	14
		December	15	5	56	34	I				
			22	8	29	16	I	4	2	10	54
	1730	January	2	0	19	53	I	4	3	2	27
			27	0	12	35	E				
		February	10	5	26	26	E				
			17	8	3	1	E	4	6	44	53

Obferved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
11	25	33	7	9	—	4	19	3	20	1	22	27	13	37	+
3	19	28	7	19	—	4	19	57	36	1	22	38	13	12	+
8	31	31	7	37	—	4	21	10	25	1	22	51	7	6	+
21	49	31	6	48	—	4	21	28	28	1	22	54	8	51	+
3	1	8	6	21	—	4	22	40	34	1	23	8	8	30	+
5	37	16	5	55	—	4	23	16	26	1	23	15	7	38	+
21	31	7	5	1	—	4	24	10	22	1	23	25	6	51	+
0	7	0	4	21	—	4	24	46	12	1	23	31	8	43	+
2	42	52	3	38	—	4	25	22	0	1	23	38	6	15	+
21	12	32	1	45	—	4	26	51	29	1	23	54	1	13	+
23	48	25	0	52	—	4	27	27	12	1	24	0	0	22	—
2	24	14	0	5	—	4	28	2	54	1	24	5	2	19	—
23	10	59	5	14	—	5	2	47	3	1	24	51	18	9	—
5	27	12	1	59	—	5	18	7	14	1	26	36	7	9	+
10	10	59	5	49	—	5	21	30	54	1	26	48	9	6	+
2	4	19	6	13	—	5	22	22	27	1	26	54	11	19	+
6	54	59	4	53	—	5	26	14	53	1	26	57	14	2	+

ECLIPSES of the Second Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Y ar	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Pekin	1730	February	27	23	57	20	E	4	7	35	58
		March	7	2	35	38	E	4	8	10	9
			14	5	11	36	E	4	8	43	54
			31	23	45	18	E	4	10	8	47
			10	2	16	34	E	4	13	14	44

Observed at the Places and Times hereunder mentioned.

Mean ☍			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
22	48	14	4	2	—	5	27	5	58	1	26	58	13	50	+
1	23	25	3	24	—	5	27	40	9	1	26	59	11	35	+
3	29	3	2	37	—	5	28	13	54	1	26	59	11	49	+
22	27	46	0	43	—	5	29	38	47	1	27	00	8	45	+
0	42	23	3	28	+	6	2	44	44	1	26	58	3	45	—

ECLIPSES of the Third Satellite of JUPITER,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Helioc. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1677	September	8	10	12	44	E	10	25	35	50
	1681	December	4	9	44	11	I	3	13	30	54
	1682	May	18	9	11	8	E	3	27	1	29
		December	26	8	46	41	I	4	14	45	11
	1683	November	6	15	51	53	I	5	9	13	36
		December	19	15	38	20	I	5	12	31	2
	1684	January	31	15	25	30	I	5	15	47	44
		May	15	10	7	47	E	5	24	31	9
	1685	February	28	17	56	59	I	6	15	38	53
	1686	June	2	10	25	25	E	7	20	39	55
	1687	January	17	18	6	17	E	8	8	38	29
		March	1	15	18	52	I	8	12	3	15
		March	1	17	52	12	E	Semiduration by			
	1688	August	27	9	34	12	E	9	27	7	58
		October	2	5	41	52	E	10	0	13	9
			9	6	9	49	I	10	0	49	33
	1689	May	19	14	3	19	I	10	20	18	23
	1690	June	10	14	55	19	E	11	25	15	21
		November	22	8	25	2	I	0	10	20	29
	1691	February	9	7	24	18	E	0	17	34	32

Obſerved at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
8	29	13	7	3	—	0	10	45	50	1	46	47	3	47	—
11	27	18	6	26	—	4	29	30	54	1	38	45	2	4	—
7	12	36	5	22	+	5	13	1	29	1	45	2	8	8	—
10	38	35	5	16	—	6	0	45	11	1	47	59	0	59	—
17	31	43	3	42	+	6	25	23	36	1	41	28	2	4	+
17	21	12	1	3	—	6	28	41	2	1	39	46	2	3	+
17	10	18	4	42	—	7	1	17	44	1	38	18	1	48	+
8	41	16	4	43	—	7	10	1	9	1	33	41	2	27	+
19	24	59	4	28	—	8	1	8	55	1	17	17	6	15	+
9	30	25	4	27	—	9	6	19	55	1	54	44	6	17	+
16	46	30	4	44	+	9	24	18	29	1	14	4	0	59	+
16	39	36	0	8	+	9	27	33	15	1	16	16	4	32	+
Obſervation										1	16	40	3	57	+
8	3	27	4	46	—	11	12	57	58	1	45	1	9	20	+
4	4	32	1	8	—	11	16	3	9	1	45	59	7	31	+
8	4	26	0	20	—	11	16	39	33	1	46	8	8	9	+
12	21	18	2	47	—	0	6	18	23	1	47	35	2	47	+
13	19	1	1	37	—	1	11	15	21	1	31	49	6	6	—
9	49	22	4	31	—	1	26	20	29	1	20	45	0	56	—
6	4	27	3	26	+	2	3	34	32	1	15	31	0	54	—

ECLIPSES of the Third Satellite of JUPITER,

Place of Observation	Mean Time of the Eclipse at *London*. Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	'	''
Greenwich	1692	March	2	8	25	31	E	1	22	40	55
—	1693	February	9	6	12	7	I	2	22	49	20
—			1	9	3	37	E	Semiduration by			
—		September	19	13	14	28	E	3	11	35	22
—	1694	March	10	9	34	9	I	3	25	42	20
—			17	13	32	53	I	3	26	17	14
—		April	15	9	3	53	E	3	28	37	11
—			22	9	31	5	E	3	29	11	12
—	1695	April	1	11	55	29	E	4	26	24	17
—			8	12	20	17	I	4	26	56	57
—		December	22	14	44	0	E	5	16	46	36
—			29	15	23	0	I	5	17	18	42
—				18	40	20	E	Semiduration by			
—	1697	March	10	17	41	1	I	6	20	24	32
—		May	21	9	27	17	I	6	25	50	20
—				11	48	36	E	Semiduration by			
—	1698	February	10	14	39	55	E	7	16	6	26
—		March	25	14	24	21	E	7	19	25	38
—	1699	July	4	9	24	44	E	8	26	22	19
Upminster	1709	October	19	6	5	6	I				

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
7	6	59	2	45	+	3	8	40	55	1	6	20	9	27	−
7	32	1	2	26	−	4	8	59	20	1	24	40	7	12	−
Observation										1	25	45	8	6	−
11	28	17	1	9	+	4	27	45	22	1	37	33	7	29	−
11	13	24	1	51	−	5	12	12	20	1	44	45	7	21	−
15	12	37	1	7	−	5	12	47	14	1	44	57	6	20	−
7	14	21	2	0	+	5	15	7	11	1	45	42	1	50	−
11	13	26	2	46	+	5	15	41	12	1	45	52	0	45	+
10	00	50	2	10	−	6	12	54	17	1	46	16	1	33	−
14	7	52	1	24	−	6	13	26	57	1	46	7	0	4	+
13	7	9	0	51	−	7	3	16	36	1	37	5	0	37	−
17	5	1	1	35	−	7	3	48	42	1	36	43	3	43	+
Observation										1	8	40	0	2	−
18	53	32	4	44	−	8	6	54	32	1	13	16	5	29	−
10	48	48	2	56	−	8	12	20	20	1	10	5	8	30	−
Observation										1	10	40	12	26	−
13	43	12	0	34	−	9	2	36	25	1	5	8	7	51	+
13	33	32	4	16	−	9	5	55	38	1	5	39	10	34	+
8	16	40	5	50	−	10	12	52	19	1	27	34	13	40	+

ECLIPSES of the Third Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*							♃ Helioc. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Upminster	1701	September	28	10	10	34	E	10	6	48	53
	1703	August	24	13	41	33	I	1	10	14	4
		September	29	9	40	13	I	1	13	28	20
		October	6	13	46	14	I	1	14	16	57
	1704	October	20	10	12	23	I	2	17	42	46
		November	3	18	10	24	I	2	18	57	19
	1705	January	14	10	7	1	I	2	25	6	32
		February	26	10	7	30	I	2	28	46	21
	1706	March	13	8	56	54	E	4	0	12	43
	1707	December	3	19	18	36	I	5	19	22	29
	1709	February	5	17	35	4	I	6	21	55	1
	1712	September	16	9	38	41	E	10	7	57	43
		October	29	6	10	11	I	10	11	42	40
	1714	September	17	8	26	38	I	0	13	53	35
		October	23	7	5	48	E	0	17	9	9
	1717	January	17	6	5	25	I	2	29	49	36
Pekin	1724	October	24	22	6	30	I				
	1725	June	11	6	43	57	I	11	6	25	39
Southwick		July	31	10	49	56	I	11	10	57	45
		August	18	10	27	53					

Observed at the Places and Times hereunder mentioned.

Mean ☌ H.	M.	S.	Equat. Light ′	″		♃ from the N. S.	°	′	″	Semiduration H.	M.	S.	Difference M.	S.	
14	45	33	4	38	—	2	27	14	4	1	5	9	5	37	—
10	51	21	7	31	—	3	0	28	20	1	5	1	1	24	—
14	57	5	7	53	—	3	1	16	57	1	5	3	2	5	—
11	29	2	5	46	—	4	4	42	46	1	21	30	10	37	—
19	29	41	6	49	—	4	5	57	19	1	22	24	9	46	—
11	31	19	5	28	—	4	12	6	32	1	27	00	8	10	—
11	31	27	0	55	—	4	15	46	21	1	29	41	6	39	—
7	6	27	1	58	—	5	17	12	43	1	46	18	6	7	—
20	57	51	1	45	—	7	26	22	19	1	35	8	5	52	+
19	2	22	1	43	—	8	8	55	1	1	12	2	13	33	+
8	6	36	3	53	—	11	25	57	43	1	47	48	11	50	+
8	9	12	0	19	+	11	29	42	40	1	48	0	11	21	+
9	53	43	8	38	—	2	1	53	35	1	16	39	1	48	+
5	59	43	7	55	—	2	5	9	9	1	14	25	0	25	+
7	30	24	5	25	—	4	18	19	36	1	31	37	11	57	—
8	39	40	3	43	—	0	25	25	36	1	41	27	10	33	+
12	48	17	7	49	—	0	29	57	45	1	39	1	11	41	+

ECLIPSES of the Third Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.						Sp	♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.		S.	°	′	″
Pekin	1725	October	3	23	3	29	I	11	16	49	9
			4	2	19	29	E	Semiduration by			
Southwick			11	6	18	6	E	11	17	29	1
Pekin		November	8	22	26	11	E	11	20	5	38
Southwick	1726	January	5	6	41	1	E	11	25	19	45
Upminster		December	15	7	11	35	E	0	26	49	29
Bononia			22	9	3	16	I	0	27	28	16
				11	11	7	E	Semiduration by			
Bononia	1727	January	27	5	17	34	I	1	0	44	24
				7	20	23	E	Semiduration by			
Petersbourg		July	25	9	56	19	I	1	16	58	28
		August	30	7	29	45	E				
		September	6	9	56	16	I	1	20	49	53
				11	47	37	E	Semiduration by			
Pekin		November	9	23	56	50	E	1	26	36	22
			17	3	54	59	E				
Petersbourg		December	1	11	58	51	E	1	28	31	9
Pekin			22	22	2	45	I	2	0	25	0
				24	1	5	E	Semiduration by			
			30	2	4	33	I	See the following			

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
24	57	24	7	45	—	1	5	49	9	1	35	26	11	14	+
Observation										1	38	0	6	26	+
4	59	29	6	29	—	1	6	29	1	1	35	3	9	57	+
21	4	24	3	39	—	1	9	5	38	1	33	18	7	18	+
5	14	39	2	19	+	1	14	19	15	1	29	37	5	34	+
6	17	54	3	38	—	2	15	49	29	1	8	18	10	29	+
10	19	29	2	51	—	2	17	28	16	1	7	40	5	42	+
Observation										1	3	55	13	23	+
6	25	49	1	3	+	2	19	44	24	1	6	50	2	28	+
Observation										1	1	24	13	21	+
10	54	12	0	18	—	3	5	58	28	1	5	38	7	3	—
10	59	53	4	40	—	3	9	49	53	1	11	27	12	20	—
Observation										0	55	45	19	10	+
22	53	48	8	14	—	3	15	36	22	1	9	3	2	13	—
11	10	59	4	58	—	3	17	31	9	1	10	0	17	7	+
23	12	27	5	56	—	3	19	25	10	1	9	42	6	17	—
Observation										0	59	10	16	36	+
Page															

ECLIPSES of the Third Satellite of *JUPITER*.

Place of Observation	Mean Time of the Eclipse at *London*.						Sp	♃ Helioceн. Place			
	Year	Months	D.	H.	M.	S.		S.	°	′	″
Pekin	1727	December	30	2	4	33	I	2	1	3	16
				4	4	1	E	Semiduration by			
Petersbourg				4	4	40	E	2	1	3	43
	1728	January	6	6	5	40	I	2	1	41	33
				8	4	23	E	Semiduration by			
Pekin		February	11	2	10	11	I	2	4	51	21
Petersbourg			18	6	12	53	I	2	5	29	11
		April	1	6	15	20	I	2	19	15	46
				8	29	42	E	Semiduration by			
Pekin		September	27	10	7	29	I	2	24	46	40
		October	26	2	1	50	I	2	27	13	33
				4	44	55	E	Semiduration by			
		November	9	10	0	58	E	3	28	26	47
	1729	January	12	21	50	44	I	3	3	54	25
			13	0	48	4	E	Semiduration by			
			20	1	53	23	I	3	4	30	43
				4	48	47	E	Semiduration by			
		March	4	1	55	50	I	3	8	7	11
		November	24	5	18	56	I	3	29	55	45
		December	1	9	16	9	I	4	0	29	32

Observed at the Places and Times hereunder mentioned.

Mean ☉			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
3	13	16	5	17	—	3	20	3	16	1	11	23	7	57	—
Observation										0	59	44	14	27	+
3	13	0	5	16	—	3	20	3	43	1	11	23	14	27	+
7	14	05	4	18	—	3	20	41	33	1	11	47	3	22	—
Observation										0	59	21	17	3	+
3	17	21	0	29	—	3	23	51	21	1	13	42	7	1	—
7	17	58	0	15	+	3	24	29	11	1	14	10	8	50	—
7	21	20	4	12	+	3	28	15	46	1	17	0	6	48	—
Observation										1	7	11	12	30	+
11	28	58	1	6	—	4	13	56	40	1	28	21	7	58	—
3	39	27	5	15	—	4	16	23	33	1	30	7	7	45	—
Observation										1	21	32	9	37	+
11	29	26	6	21	—	4	17	36	47	1	31	1	8	54	—
23	18	40	6	5	—	4	23	4	25	1	34	47	2	56	—
Observation										1	28	40	9	19	+
3	28	32	5	31	—	4	23	50	43	1	35	16	5	38	—
Observation										1	27	42	9	46	+
3	27	06	1	6	—	4	27	27	11	1	37	31	6	21	—
7	5	39	3	53	—	5	19	5	2	1	46	47	3	57	—
11	4	18	4	30	—	5	19	39	32	1	47	20	1	20	—

ECLIPSES of the Third Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London* Year	Months	D.	H.	M.	S.	Sp	♃ Heliocen. Place S.	°	′	″
Pekin	1729	December	30	1	8	23	I	4	2	47	57
	1730	January	6	5	6	28	I	4	3	22	32
		February	4	0	35	12	E	4	5	41	3
			11	4	32	47	E	4	6	15	27
		March	19	0	33	8	E	4	9	6	52
			26	0	57	14	E				
		May	1	0	31	38	E	4	12	31	48
				omitted							
Greenwich	1702	October	20	8	23	33	I	0	12	7	1
				11	1	57	E	Semiduration by			
	1703	September	22	7	58	42	E	1	12	50	7
	1704	January	29	8	18	43	E	1	24	25	7

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
3	0	33	6	10	−	5	21	57	57	1	47	20	1	20	−
6	59	35	6	18	−	5	22	32	32	1	47	33	0	44	−
22	55	52	5	42	−	5	24	51	3	1	47	43	0	41	+
2	54	50	5	18	−	5	25	25	27	1	47	46	2	31	+
22	49	21	2	9	−	5	28	36	52	1	47	58	2	2	+
22	42	25	2	30	+	6	2	1	38	1	48	57	2	14	+
9	52	2	7	49	−	1	29	7	1	1	18	39	2	1	+
Observation										1	19	12	0	42	+
6	50	35	7	5	−	2	29	50	7	1	5	0	10	12	−
7	7	58	1	2	−	3	11	25	7	1	7	15	4	2	−

ECLIPSES of the Fourth Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	′	″
Greenwich	1677	November	13	6	45	45	I	11	1	29	58
	1682	September	24	17	32	36	E	4	7	24	49
		December	17	11	16	13	E	4	14	3	6
	1688	August	7	11	30	35	I	9	25	25	20
			24	10	14	23	E	9	26	52	41
		October	30	6	21	12	I	10	2	38	36
	1689	October	17	9	6	42	E	11	3	47	59
	1693	January	19	6	0	26	E	2	21	1	8
	1694	February	25	9	16	21	E	3	24	38	54
		April	16	10	55	34	I	3	28	42	28
		August	28	16	18	52	E	4	9	27	41
	1705	February	11	8	41	15	I	2	27	29	32
	1712	August	20	8	34	48	I	10	5	36	20
		September	6	7	35	5	E	10	7	4	55
		October	30	6	36	45	E	11	14	26	52
	1729	January	4	22	54	8	I	3	3	14	12
			5	1	48	8	E	Semiduration by			
		March	12	23	6	28	I	3	8	51	54
			13	2	30	8	E	Semiduration by			

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
8	52	54	6	36	—	0	16	59	58	2	12	48	6	16	—
15	1	53	1	22	+	5	22	54	49	2	21	18	8	3	—
8	59	32	4	21	—	5	29	33	6	2	22	58	1	56	+
13	57	48	6	29	—	11	11	5	20	2	10	22	10	22	+
8	12	45	5	6	—	11	12	32	41	2	12	15	4	51	+
2	25	49	1	45	+	11	18	18	36	2	18	10	9	24	+
7	14	49	4	53	—	0	19	27	59	2	8	12	11	26	+
5	9	13	4	42	—	4	6	41	8	0	0	0			
7	3	38	3	15	—	5	10	38	54	2	9	46	6	12	—
13	10	41	0	45	+	5	14	42	28	2	14	45	1	7	+
9	49	38	15	44	—	4	14	29	32	1	1	0	10	0	+
11	2	50	6	24	—	11	23	36	20	2	21	31	0	7	+
5	18	19	5	2	—	11	25	4	55	2	22	5	0	17	+
4	44	30	4	37	—	1	2	26	52	1	44	59	11	58	—
0	25	05	7	22	—	4	22	14	12	1	30	17	6	8	—
Observation										1	27	00		16	+
8	9	5	0	7	—	4	27	51	54	1	45	47	5	11	—
Observation										1	42	00	3	12	+

ECLIPSES of the Fourth Satellite of *JUPITER*,

Place of Observation	Mean Time of the Eclipse at *London*.							♃ Heliocen. Place			
	Year	Months	D.	H.	M.	S.	Sp	S.	°	'	''
Pekin	1729	November	19	5	20	24	I	3	29	30	37
				9	55	54	E	Semiduration by			
	1730	January	25	10	6	18	E	4	4	54	56
		February	10	23	12	58	I	4	6	13	22
			11	3	57	43	E	Semiduration by			

Observed at the Places and Times hereunder mentioned.

Mean ☌			Equat. Light			♃ from the N.				Semiduration			Difference		
H.	M.	S.	′	″		S.	°	′	″	H.	M.	S.	M.	S.	
7	36	33	3	25	—	5	18	30	37	2	18	28	5	46	—
Observation										2	17	40	3	14	—
7	41	1	6	7	—	5	23	54	56	2	21	49	9	35	—
25	42	39	5	19	—	5	25	13	22	2	22	9	2	23	+
Observation										2	22	22	2	29	+

IN this Collection of the Eclipses of the Four Satellites of *Jupiter*, the first Column shews the Place where the Observation was made, the second the Year, the third the Month, the fourth the mean Time of the Eclipse, reduced to the Meridian of *London*, the fifth the Kind, where *I* signifies an Immersion, and *E* an Emersion, the sixth the Heliocentrick Place of *Jupiter* at that Time, the seventh the Time of the mean Conjunction of the Satellite with *Jupiter*, the eighth the compound Equation of Light and Days, the ninth the Distance of *Jupiter* from the Node of the Satellite, the tenth the Semiduration of the Eclipse, and the eleventh the Difference between the Times computed from the Tables, and the Times of Observation, where (+) shews how long the Eclipse happened before the computed Time, and (—) how long it happened after the Time computed from the Tables.

My principal View in making this Collection of Observations was to obtain all the Helps I could towards the Rectification of the Tables, in doing which I have spared no Pains; and after I had brought them as near the Truth as the Multiplicity of my Affairs, and my daily Avocations would admit, I set myself about comparing them with the Heavens, and how much the Times deduced from the Tables differ from the Times of the Observation, may be seen in the last Column; and the better to discover the Cause of the Variation, I have set down the chief Elementary Parts of the Calculus; and whether these Differences arise in Part from the Excentricities of the Orbs of the Satellites, the Motion of the Apsides, the Place of their Nodes, or their mutual Attractions amongst themselves, does not clearly appear, but probably from them all.

It appears from Observations, that the Fourth Satellite moves in an Elliptick Orb, that it's greatest Equation is about 40 Minutes, the same with that of the Planet *Venus*; that the Errors of the First and Third are not near so great as those of the Second, but may probably arise from the same Cause, or from a small Excentricity only, but as their Orbs are very small, it will be very difficult to fix their Situations till we are furnished with much better Telescopes than we have at present.

As to the Places of the Nodes, I have supposed the ascending Node to be placed in 10 Degrees, 30 Minutes of *Aquarius*, and that the Inclination of their Orbs to the Plane of *Jupiter*'s Orb, is 2 Degrees, 55 Minutes.

A TABLE

A TABLE *shewing the Latitudes, and Difference of Meridians in Time, between* London, *and the Principal Places in the most frequented Parts of the World.*

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Acapulco *in* Mexico	17	30	N	7	5	W
Achin, *the North Point of* Sumatra	05	30	N	6	16	E
Agra, *the Mogul's Court*	26	40	N	5	7	E
Aleppo *in* Syria	35	40	N	2	29	E
Alexandretta *in* Turkey	36	40	N	2	28	E
Alexandrina *in* Egypt	31	11	N	2	3	E
Amiens *in* France	49	54	N	0	17	E
Amoy, *in the* East-Indies	24	35	N	7	48	E
Amsterdam *in* Holland	52	23	N	0	20	E
Antego, *one of the Leward Islands*	17	30	N	4	3	W
Antibes *in* France	43	34	N	0	29	E
Antwerp *in* Flanders	51	10	N	0	17	E
Avignon *in* France	43	57	N	0	19	E
Babylon *in* Asia	34	30	N	3	14	E
Ballasore *Road in* India	21	20	N	5	45	E
Banjar *in* Borneo	3	00	S	7	19	E
Berlin *in* Prussia	52	31	N	0	53	E
Bridge Town *in* Barbadoes	12	58	N	5	45	E
Barcelona *in* Spain	41	26	N	0	11	E
Batavia *in the* East-Indies	6	15	S	7	3	E
Bahama *Island*	26	30	N	5	16	W
Bay of all Saints *in* Brazil	13	00	S	2	42	W
Bermudas	32	30	N	4	15	W
Basora, *by the River* Euphrates	30	00	N	3	22	E
Bell Isle *in* Newfoundland	52	10	N	3	41	W
Bencola *in* Sumatra	3	50	S	6	45	E
Bantam *in* Java	5	47	S	7	0	E
Bayonne *in* Spain	43	30	N	0	6	W

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Bay of St Auguſtin *in* Florida	30	10	N	5	23	W
Bengall *in the* Eaſt-Indies	22	27	N	6	8	E
Bergen *in* Norway	61	00	N	0	32	E
Bombay *in* India	18	58	N	4	48	E
Bononia *in* Italy	44	30	N	0	47	E
Boſton *in* New England	42	25	N	4	42	W
Bourdeaux *in* France	44	50	N	0	2	W
Buenos Aires *in* America	34	35	S	3	32	W
Breſt *in* France	48	23	N	0	18	W
New Calabar *in* Guinea	4	40	N	0	33	E
Cadiz *in* Spain	36	16	N	0	26	W
Calais *in* France	50	57	N	0	7	E
Camboia *in* India	10	20	N	6	54	E
Cambridge *in* New England	42	45	N	4	42	W
Grand Canaria	27	40	N	1	5	W
Canea *in* Crete	35	29	N	1	33	E
Candia *in the Mediterranean*	35	18	N	1	37	E
Canton *in* China	23	20	N	7	32	E
Campeche *in the* Weſt-Indies	19	20	N	5	58	W
Calecut *in* India	11	17	N	5	1	E
Cape Amber *in* Madagaſcar	12	05	S	3	28	E
Cape St Anthony *in the River* Plate	35	20	S	3	49	W
Cape Agathus, *near the* Cape of Good Hope	35	00	S	1	11	E
Cape St Anthony *in* Cuba	21	30	N	5	44	W
Cape St Auguſtin *in* Brazile	8	05	S	2	23	W
Cape Bayador *in* Barbary	26	12	N	1	4	W
Cape of Good Hope	34	15	S	1	6	W
Cape Blanco *in* America	46	50	S	4	45	W
Cape Britain *in* Newfoundland	46	10	N	3	55	W
Cape Catine *in* Barbary	32	16	N	0	36	W
Cape Charles *in* Virginia	37	40	N	4	54	W
Cape Clear *in* Ireland	51	00	N	0	40	W
Cape Cod *in* New England	42	10	N	4	34	W
Cape Comerin *in* India	8	00	N	5	7	E

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Cape Corientes *in* America	19	40	N	7	20	W
Cape Finister	43	10	N	0	40	W
Cape Florida *in* America	24	48	N	5	27	W
Cape Formosa	4	8	N	0	23	E
Cape de Gallo *in* Ceylan	6	7	N	5	20	E
Cape Gardafui *in the* Red Sea	11	50	N	3	23	E
Cape Hateras *in* Carolina	35	10	N	4	58	W
Cape Henry *in* Virginia	37	00	N	4	58	W
Cape Horn *in* Terra del Fuego	57	30	N	5	20	W
Cape de Liampo *in* China	28	30	N	1	22	E
Cape Lopes *in* Africa	1	5	S	0	40	E
Cape Naffaw *in* America	9	25	N	3	52	W
Cape Negrais *in* Bengall	16	23	N	6	17	E
Cape Negro *in* Africa	16	8	S	0	54	E
North Cape *in* America	2	5	N	3	20	W
Cape Orange *in* America	4	5	N	3	26	W
Cape Ortegal, *in the* Bay of Bisca	44	2	N	0	31	W
Cape Palmas *in* Guinea	4	3	N	0	29	W
Cape Palmiras *in* Bengall	21	00	N	5	51	E
Cape Race *in* Newfoundland	46	30	N	3	37	W
Cape Rasalgat *in* Persia	22	50	N	4	3	W
Cape Roque *in* Brazile	5	0	S	2	54	W
Cape Sable *in* Nova Scotia	43	45	N	4	21	W
Cape St Sebastian *in* Africa	21	40	S	2	23	W
Cape Three Points *in* Guinea	4	13	N	0	10	W
Cape Siera Leona *in* Guinea	8	5	N	0	53	W
Cape Spartel *in the* Streights	35	56	N	0	24	W
Cape Trio *in* Brazile	22	20	S	3	48	W
Cape Victory *in* Magellan	52	45	S	5	33	W
Cape Vorde *in* Goree	14	43	N	1	9	W
Cape St Mary *in* Magellan	52	00	S	5	1	W
Cape St Vincent	37	06	N	0	38	W
Cape Voltas *in* Africa	29	00	S	1	4	E
Cartagena *in* America	10	30	N	5	2	W
Cayenne *in the* West-Indies	4	56	N	3	33	W

Places Names.	Latitude.			Diff. of L.		
	D.	M.		H.	M.	
Cayro *in* Egypt	30	04	N	2	6	E
Charles Town, *upon* Ashley River	32	40	N	5	15	W
Cheusan *in* China	30	00	N	8	2	E
Cubumbo *in* Ceylan	6	35	N	5	17	E
Cochin *in* the East Indies	10	00	N	5	3	E
Conimbra *in* Portugal	40	30	N	0	39	W
Constantinople *in* Turkey	41	07	N	1	56	E
Copenhagen *in* Denmark	56	13	N	0	51	E
Corvo, *one of the Western Isles*	39	55	N	2	8	W
Cracow *in* Poland	50	10	N	0	42	E
East End of Cuba	20	05	N	4	56	W
Custo *in* Peru	12	25	S	5	6	W
Darien *in* America	8	30	N	5	15	E
Dantzick *in* Poland	54	04	N	1	16	E
Darwinda *in the* Baltic Sea	57	15	N	1	8	E
Deu Point *in* Cormandel	16	29	N	5	25	E
Diep *in* Normandy	49	56	N	0	7	E
Saint Domingo *in* Hispaniola	18	20	N	4	45	W
Dublin *in* Ireland	53	12	N	0	28	W
Dunkirk *in* Flanders	51	01	N	0	10	E
Durazzo *in* Dalmatia	41	58	N	1	10	E
Edinburgh *in* Scotland	55	57	N	0	12	W
Embden *in* North Holland	53	05	N	0	30	E
Elsenore, *in the* Baltic Sea	56	33	N	0	50	E
Fero Insula, *one of the* Canary Isles	27	35	N	1	17	W
Fez *in* Moroco	33	10	N	0	24	E
Florence *in* Italy	43	41	N	0	45	E
Formosa, *in the* East-Indies	25	06	N	5	38	E
Fort St George *in* India	13	08	N	5	20	E
Frankfort *on the Main*	50	04	N	0	35	E
Fyal, *one of the Western Islands*	39	18	N	2	0	W
Geneva *in* Italy	46	22	N	0	26	E
Genoa *in* Italy	44	27	N	0	39	E
Ghent *in* Flanders	51	03	N	0	15	E
Goa *in* India	15	31	N	4	55	E

Goes

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Goes *in* Zeland	51	30	N	0	16	E
Gottenburgh *in* Sweedland	58	07	N	0	44	E
Greenwich, *at the Observatory*	51	28½	N	0	00½	E
Guadaloupa	16	30	N	4	5	E
Grenoble *in* France	45	16	N	0	24	E
Hamburgh *in* Denmark	53	41	N	0	42	E
Havannah *in* Cuba	22	40	N	5	32	W
Havre de Grace *in* France	49	30	N	0	0½	E
Heidelburgh *in* Germany	49	20	N	0	36	E
Hoaignan *in* China	33	35	N	7	52	E
Jamaica Port Royal	17	40	N	5	07	W
Japan *South East End*	35	20	N	2	47	E
Japan *South West End*	34	30	N	8	38	E
Java *East End*	8	50	S	7	34	E
Java *West End*	6	30	S	6	55	E
Jerusalem *in* Syria	31	50	N	2	21	E
Ingolstadt *in* Germany	48	40	N	0	46	E
Inspruck *in* Germany	47	15	N	0	47	E
Island of Ascension, *in the Southern Ocean*	7	40	S	0	59	W
Island of Trinidada, *in the Southern Ocean*	20	30	S	2	0	W
Ispahan *in* Persia	32	25	N	3	31	E
Judda, *in the Red Sea*	21	30	N	3	31	E
Konningsbergh *in* Prussia	54	43	N	1	26	E
Leghorn *in* Italy	43	18	N	0	56	E
Leipsiek *in* Germany	51	19	N	0	53	E
Leige *in* Germany	50	40	N	0	24	E
Lima *in* Peru	12	01	S	5	15	W
Lintz *in* Austriæ	48	16	N	1	00	E
Lione *in* France	45	45	N	0	20	E
Lisbon *in* Portugal	38	43½	N	0	36½	W
London *in* England	51	32	N	0	0	
The Lizard *in* England	50	00	N	0	21	W
Loando de St Paulo *in* Africa	9	20	S	0	57	E
Lubaw *in* Courland	56	32	N	1	27	E
Lubec *in* Denmark	54	46	N	0	39	E

Macao

Places Names.	Latitude.			Diff. of L.		
	D.	M.		H.	M.	
Macao *in* China	22	13	N	7	44	E
Madagascar	19	29	S	2	18	E
Madera, *West End*	32	20		1	07	W
Madrid *in* Spain	40	10		0	13	W
Majorca, *in the* Mediterranean	39	35		0	12	W
Mallaca *in* India	3	20		6	43	E
Malta, *in the* Mediterranean	35	54		0	58	E
Martineca, *in the* West-Indies	14	44		4	2	W
Marseilles *in* France	43	20		0	22	E
Saint Maloes	48	38		0	9	W
Saint Mary, *one of the Western Isles*	36	55		1	38	W
Meca *in* Arabia Fœlix	23	00		2	45	E
Messina *in* Sicily	38	21		1	6	E
Mexico *in* America	20	6	North Latitude.	6	49	W
Muchin *in* Bavaria	48	58		0	35	W
Montpelier *in* France	43	36		0	15	E
Moscow *in* Moscovia	55	34		2	35	E
Namur *in* Flanders	50	25		0	20	E
Nangasack *in* Japan	32	53		8	35	E
Nancy *in* Lorrain	48	39		0	27	E
Nants *in* France	47	13		0	6	W
Naples *in* Italy	40	48		0	57	E
Nanquin *in* Italy	34	55		8	0	E
Naze *of* Norway	58	10		0	35	E
Narbon, *in the* Mediterranean	43	15		0	13	E
Narsinga, *in the* East-Indies	18	15		5	24	E
New York Fort *in* America	40	40		4	56	W
Nerva *in* Livonia	59	47		1	34	E
Nice *in* Provence	43	38		0	29	E
Ningpo, *or* Liampo, *in* China	29	58		8	1	E
Noremberg *in* Germany	49	29		0	49	E
Nicopingin *in* Swedeland	58	44		1	08	E
Oldenbourg *in* Germany	55	00		0	40	E
Olinda *in* Brazile, *or* Pernambuch	7	48	S	2	20	W
Oporto *in* Portugal	41	18	N	0	38	W

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Oxford *in* England	51	44½	N	0	5	W
Ozaca *in* Japan	35	5	N	9	5	E
Padua *in* Italy	45	31	N	0	45	E
Panama *in* America	8	56	N	5	29	W
Paris *in* France, *at the Obſervatory*	48	50	N	0	9	E
Pekin *in* China, *at the Obſervatory*	39	55	N	7	48	E
Peterſbourg, *in the* Baltic *Sea*	60	30	N	2	1	E
Pico, *one of the Weſtern Iſlands*	38	45	N	2	0	E
Pico Teneriff, *in the Weſtern Ocean*	28	30	N	1	13	E
Pernaw, *in the* Baltic *Sea*	58	28	N	1	43	E
Puli Condor *in the* Eaſt-Indies	8	45	N	7	4	E
Portobello *in* America	9	55	N	5	21	W
Port St Julian *in* America	48	40	S	4	56	W
Port Royal *in* America	32	22	N	5	13	W
Pondicherri *in the* Eaſt-Indies	11	54	N	5	21	W
Prague *in* Bohemia	50	40	N	0	58	E
Providence, *one of the* Bahama *Iſlands*	25	00	N	5	9	W
Quebeck, New France	46	55	N	4	40	W
Ratiſbon *in* Germany	48	59	N	0	49	E
Reggio *in* Italy	42	15	N	1	3	E
Riga *in* Livonia	57	04	N	1	42	E
Revel *in* Livonia	59	35	N	1	39	E
River Gallego *near* Magellan	52	10	S	5	01	W
Rhodes *in* France	44	20	N	0	10	E
Rhodes *in the* Mediterranean *Sea*	36	42	N	1	52	E
Rochell *in* France	46	10	N	0	4	W
Rome *in* Italy	41	54	N	0	52	E
Roſtock *in* Denmark	54	37	N	0	46	E
Rotterdam *in* Holland	51	55	N	0	17	E
Roven *in* France	49	27	N	0	15	E
Salamanca *in* Spain	41	12	N	0	16	W
Saint Salvador *in* Brazile	12	47	S	2	42	W
Sal, *on of the* Cape de Verd Iſlands	16	45	N	1	30	W
Salonica *in* Greece	40	41	N	1	33	E
Saint Sebaſtian *in* Madagaſcar	25	32	S	3	9	E

Places Names.	Latitude. D.	M.		Diff. of L. H.	M.	
Sevil *in* Spain	37	36	N	0	22	W
Scandroon *in* Turky	36	40	N	2	28	E
Siam *in* India	14	18	N	6	43	E
Smirna *in* Ionia, *in the* Leſſer Aſia	38	28	N	1	49	E
Sphaham *in* Perſia.	36	14	N	4	20	E
Stockholm *in* Swedeland	59	20	N	1	13	E
Stralſond *in the* Baltic *Sea*	54	37	N	0	53	E
Streights of Sunday, *in the* Eaſt-Indies	5	52	S	6	57	E
Surinam *in* America	6	30	N	3	48	W
Surrat *in* India	21	10	North Latitude.	4	52	E
Syracuſa *in* Sicily	37	04		1	1	E
Tangier, *in the Streights Mouth*	35	35		0	21	W
Teneriff, *North Point*	28	25		1	9	W
Toledo *in* Spain	39	46		0	14	W
Toloun *in* France	43	07		0	23	E
Trinidada, *one of the Charibbee Iſlands*	10	05		4	1	W
Tripoly *in* Barbary	32	54		0	52	E
Tubing *in* Germany	48	34		0	37	E
Valentia *in* Spain	39	30		0	3	E
Venice *in* Italy	45	48		0	50	E
Vera Cruz *in* America	19	12		6	38	W
Vienna *in* Germany	48	22		1	9	E
Upſal *in* Swedeland	59	00		1	12	E
Uraniburg *in* Denmark	55	54		0	51	E
Utrecht, *in the Low Countries*	52	05		0	20	E
Widdah, *in* Guinea	6	35		0	17	E
Wirtemberg *in* Saxony	51	53		0	52	E
Wolfenbuttle *in* Germany	52	11		0	44	E
Wyborg, *in the* Baltic *Sea*	61	12		1	53	E
Ylo *in* Peru	17	36		4	45	W
York *in* England	54	00		0	4	W

The

The USE of the Preceding TABLE.

BY the Help of this Table, may the Time when an Eclipſe of either of the Satellites of *Jupiter* will happen, in any of the Places therein mentioned, be eaſily found; for if the Place propoſed lays to the Eaſtward of *London*, you muſt add the Difference of Meridians between *London*, and the Place propoſed, to the Time it happens at *London*, and the Sum will give the Time when it will happen at the Place propoſed; but if the Place given lays to the Weſtward of *London*, you muſt ſubſtract the Difference of Meridians between *London* and the Place given, from the Time it will happen at *London*, and the Remainder will ſhow the Time when it will happen at the given Place. For Example, it appears by a Computation from theſe Tables, that on *January* the 1ſt, 1750, at 21 Hours, 30 Minutes, 11 Seconds, there will happen an Emerſion of the Firſt Satellite of *Jupiter* at *London*; and let it be required to find at what Time it will happen at the Obſervatory at *Pekin* in *China*; now becauſe the Obſervatory at *Pekin* lays 7 Hours, 47 Minutes, 40 Seconds, nearly, to the Eaſtward of the Meridian of *London*: If to 21 Hours, 30 Minutes, 11 Seconds, the Time it will happen at *London*, be added 7 Hours, 47 Minutes, 20 Seconds, the Sum will give *January* 1, at 28 Hours, 17 Minutes, 55 Seconds, that is *January* the 2d, at 4 Hours, 17 Minutes, 55 Seconds, for the Time it will happen at *Pekin*. Again, Suppoſe it be required to find when the ſame Emerſion will happen at *Cambridge*, in *Boſton* in *New England*, becauſe the Difference of Meridians between *London* and *Boſton* in *New England*, is 4 Hours, 42 Minutes, 28 Seconds: *New England* lying ſo much to the Weſtward of *London*, if from 21 Hours, 30 Minutes, 11 Seconds, be taken 4 Hours, 42 Minutes, 28 Seconds, the Remainder 16 Hours, 47 Minutes, 43 Seconds, will give the Time when it will happen at *Boſton* in *New England*, and after the ſame Manner may the Time be found, when it will happen in any other Place.

F I N I S.

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